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# EPA Utility FGD Survey: January-March 1980

PEDCo-Environmental, Inc.
Cincinnati, OH

Prepared for

Industrial Environmental Research Lab.
Research Triangle Park, NC

May 80

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Industrial Environmental Research
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Research Triangle Park NC 27711

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EPA

# EPA Utility FGD Survey:
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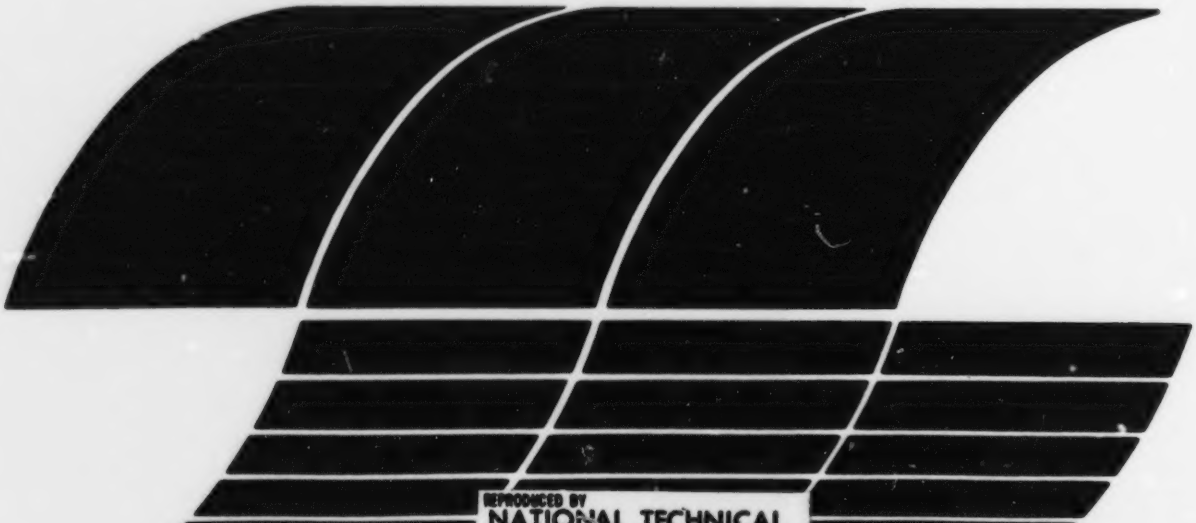
## Interagency Energy/Environment R&D Program Report



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17. KEY WORDS AND DOCUMENT ANALYSIS

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|---|---|---|---|
| Pollution | Maintenance | Pollution Control | 13B |
| Flue Gases | | Stationary Sources | 21B |
| Desulfurization | | Utility Boilers | 07A,07D |
| Electric Utilities | | | |
| Waste Disposal | | | 15E |
| Boilers | | | 13A |

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# EPA Utility FGD Survey:
## January-March 1980

by

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Program Element No. INE828

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Office of Research and Development
Washington, DC 20460

and

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement
Washington, DC 20460

i.a

# NOTICE

This report (prepared by PEDCo Environmental, Inc., Cincinnati, Ohio under EPA Contract No. 68-01-4147, Task No. 143) is provided as an information transfer document. Data in this report are supplied voluntarily by utility representatives; flue gas desulfurization (FGD) system designers and suppliers; regulatory personnel; and others. Neither EPA nor the designated contractor warrants the accuracy or completeness of information contained in this report.

Initial distribution of the report (generally one copy per company) is limited to organizations and individuals indicating a specific interest in the field of FGD technology. Additional copies of this report and succeeding issues can be purchased from National Technical Information Service, Springfield, Virginia 22151.

## USE OF THIS REPORT

This report is the first of three supplementary issues to the October-December 1979 report. Supplementary issues are cumulative, so that it is necessary to retain only the latest issue and the October-December 1979 report (EPA-600/7-80-029a).

It should be noted that along with the design and performance data for operational FGD systems contained in Section 3, this report also contains a number of tables presenting tabulations of some of the key data. The Executive Summary contains the number and capacity of FGD systems as of the end of March 1980, future projections (January 1990) of controlled and uncontrolled generating capacity, and unit by unit summaries of status changes and performance during the period.

Recent additions to this report include a section containing design and performance data for U.S. operational particle scrubbers (Section 14) and a section containing design and performance data for coal-fired operational Japanese FGD systems (Section 15). The regulatory classifications were recently modified to accomodate the revised New Source Performance Standards (6/79) and, as a result, the categories will differ slightly from those of previous issues.

Appended to this report is a section containing reported and adjusted cost data for U.S. FGD systems in which operational systems are stressed (Appendix A). Also included in the appendices are definitions and a glossary of units.

# ABSTRACT

This report is the first of three supplements updating the October - December 1979 report (EPA-600/7-80-029a) and should be used in conjunction with it. The report, which is generated by a computerized data base system, presents a survey of operational and planned domestic utility flue gas desulfurization (FGD) systems, operational domestic particle scrubbers, and Japanese coal-fired utility boiler FGD installations. It summarizes information contributed by the utility industry, process suppliers, regulatory agencies, and consulting engineering firms. It presents data on system design, fuel characteristics, operating history and actual performance. Unit by unit dependability parameters are included and problems and solutions associated with the boilers, scrubbers, and FGD systems are discussed.

The domestic FGD systems are tabulated alphabetically by development status (operational, under construction, or in the planning states), utility company, system supplier, process, waste disposal practice, and regulatory class. FGD system economic data, definitions, and a glossary of terms are appended to the report. Current data for operational domestic FGD systems show 65 systems in operation, 42 systems under construction, and 74 planned systems. Projected 1990 FGD controlled capacity in the U.S. is 85,671 MW.

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## EXECUTIVE SUMMARY

This report is prepared quarterly (every three months) by PEDCo Environmental, Inc., under contract to the Industrial Environmental Research Laboratory/Research Triangle Park and the Division of Stationary Source Enforcement of the U.S. Environmental Protection Agency. It is generated by a computerized data base system, the structure of which is illustrated in Figure 1.

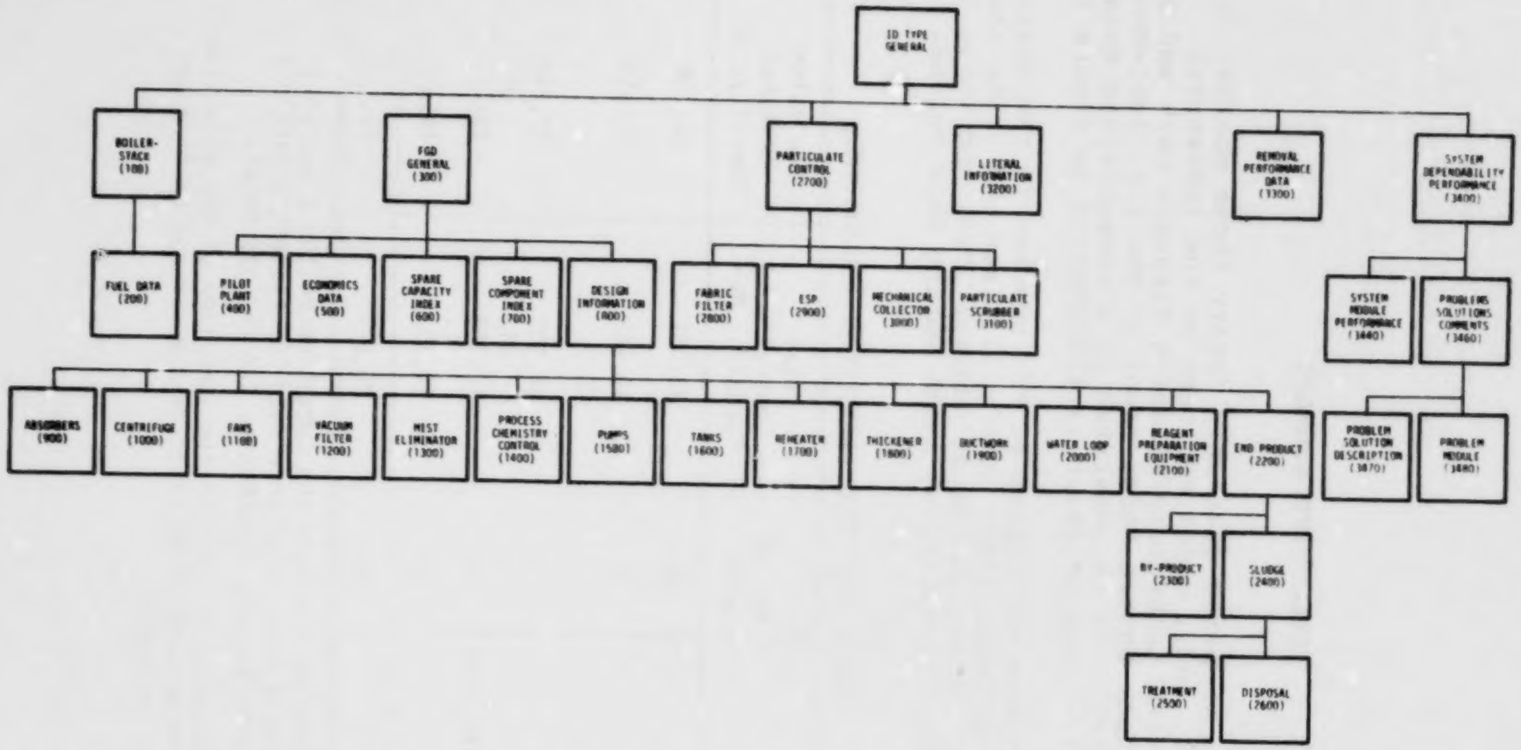
Table 1 summarizes the status of FGD systems in the United States at the end of March 1980. Table II lists the units that have changed status during the first quarter 1980, and Table III shows the performance of operating units during this period.

TABLE 1. NUMBER AND TOTAL CAPACITY OF FGD SYSTEMS

| Status | No. of units | Total Controlled Capacity, MW* | Equivalent Scrubbed Capacity, MW† |
|---|---|---|---|
| Operational | 65 | 23,887 | 22,100 |
| Under construction | 42 | 19,583 | 18,454 |
| Planned: | | | |
| Contract awarded | 23 | 11,532 | 10,519 |
| Letter of intent | 2 | 842 | 842 |
| Requesting/evaluating bids | 15 | 10,255 | 10,221 |
| Considering only FGD systems | 34 | 19,572 | 19,432 |
| TOTAL | 181 | 85,671 | 81,568 |

* Total Controlled Capacity (TCC) is the summation of the gross unit capacities (MW) brought into compliance with FGD systems regardless of the percent of the flue gas scrubbed by the FGD system(s).

† Equivalent Scrubbed Capacity (ESC) is the summation of the effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system(s).


ID TYPE GENERAL
BOILER-STACK (100)
FGD GENERAL (300)
PARTICULATE CONTROL (2700)
LITERAL INFORMATION (3200)
REMOVAL PERFORMANCE DATA (3300)
SYSTEM DEPENDABILITY PERFORMANCE (3400)
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PUMPS (1500)
TANKS (1600)
REHEATER (1700)
THICKENER (1800)
DUCTWORK (1900)
WATER LOOP (2000)
REAGENT PREPARATION EQUIPMENT (2100)
END PRODUCT (2200)
PROBLEM SOLUTION DESCRIPTION (3470)
PROBLEM MODULE (3480)
BY-PRODUCT (2300)
SLUDGE (2400)
TREATMENT (2500)
DISPOSAL (2600)

Figure 1. Computerized data base structure diagram.

# TABLE II. SUMMARY OF CHANGES
# JANUARY - MARCH 1980

| FGD status report | Operational | | Under construction | | Contract awarded | | Letter of intent | | Requesting/ eval. bids | | Considering FGD | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | MW* | No. | MW* | No. | MW* | No. | MW* | No. | MW* | No. | MW* | No. | MW* |
| 12/31/79 | 62 | 21,521[a] | 39 | 16,051 | 23 | 11,631[a] | 2 | 842 | 15 | 10,281 | 35 | 19,902 | 176 | 80,228[a] |
| Arizona Electric Power Coop | | | | | | | | | | | | | | |
| Four Corners 1 | +1 | 175 | -1 | 175 | | | | | | | | | | |
| Four Corners 2 | +1 | 175 | -1 | 175 | | | | | | | | | | |
| Four Corners 3 | +1 | 229 | -1 | 229 | | | | | | | | | | |
| Basin Electric Power Coop | | | | | | | | | | | | | | |
| Laramie River 3 | | | +1 | 600 | -1 | 600 | | | | | | | | |
| Cincinnati Gas & Electric | | | | | | | | | | | | | | |
| East Bend 1 | | | | | | | | | | | +1 | 650 | +1 | 650 |
| Deseret Generation & Trans. Coop | | | | | | | | | | | | | | |
| Moon Lake 1 | | | | | | | | | +1 | 410 | | | +1 | 410 |
| Moon Lake 2 | | | | | | | | | +1 | 410 | | | +1 | 410 |
| Grand Haven Brd. of Light & Pwr. | | | | | | | | | | | | | | |
| J.B. Sims 3 | | | | | +1 | 81 | | | | | | | +1 | 81 |
| Michigan So. Central Pwr. Agency | | | | | | | | | | | | | | |
| Project 1 | | | | | +1 | 55 | | | | | | | +1 | 55 |
| Muscatine Power & Water | | | | | | | | | | | | | | |
| Muscatine 9 | | | | | +1 | 160 | | | -1 | 160 | | | | |
| Nevada Power | | | | | | | | | | | | | | |
| Reid Gardner 4 | | | | | | | | | +1 | 250 | -1 | 250 | | |
| New York State Elec. & Gas | | | | | | | | | | | | | | |
| Somerset 1 | | | | | | | | | +1 | 870 | -1 | 870 | | |
| Philadelphia Electric | | | | | | | | | | | | | | |
| Eddystone 1B | | | +1 | 240 | -1 | 240 | | | | | | | | |
| Eddystone 2 | | | +1 | 334 | -1 | 334 | | | | | | | | |
| Seminole Electric | | | | | | | | | | | | | | |
| Seminole 1 | | | | | +1 | 620 | | | -1 | 620 | | | | |
| Seminole 2 | | | | | +1 | 620 | | | -1 | 620 | | | | |
| Tennessee Valley Authority | | | | | | | | | | | | | | |
| Johnsonville 1-10 | | | | | +1 | 600 | | | -1 | 600 | | | | |
| Paradise 1 | | | +1 | 704 | -1 | 704 | | | | | | | | |
| Paradise 2 | | | +1 | 704 | -1 | 704 | | | | | | | | |
| Texas Municipal Power Agency | | | | | | | | | | | | | | |
| Gibbons Creek 1 | | | +1 | 400 | -1 | 400 | | | | | | | | |
| United Power Association | | | | | | | | | | | | | | |
| Stanton 2 | | | | | +1 | 50 | | | | | | | +1 | 50 |
| Wisconsin Power & Light | | | | | | | | | | | | | | |
| Columbia 2 | | | | | -1 | 316 | | | | | | | -1 | 316 |
| TOTAL | 65 | 22,100 | 42 | 18,454 | 23 | 10,519 | 2 | 842 | 15 | 10,221 | 34 | 19,432 | 181 | 81,568 |

* Equivalent scrubbed capacity.

[a] This value was modified slightly due to a MW correction.

# TABLE III. PERFORMANCE OF OPERATIONAL UNITS
## JANUARY - MARCH 1980

| Plant | FGD system capacity, MW$^a$ | Flue gas % scrubbed | FGD capacity on line during period, MW$^{a,b}$ | No information for this period, MW$^a$ | Shut down throughout period, MW$^a$ | January 1980 Dependability %$^{c,e}$ | | | | February 1980 Dependability %$^{c,e}$ | | | | March 1980 Dependability %$^{c,e}$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AVL | OPR | REL | UTL | AVL | OPR | REL | UTL | AVL | OPR | REL | UTL |
| Tombigbee 2 | 179 | 70 | 179 | | | 90 | 82 | | 48 | 99 | 99 | | 99 | 100 | 98 | | 90 |
| Tombigbee 3 | 179 | 70 | 179 | | | 100 | 98 | | 43 | 100 | 100 | | 3 | 100 | | | 0 |
| Pleasants 1 | 519 | 83 | | 519 | | | | | | | | | | | | | |
| Apache 2 | 195 | 100 | 195 | | | 90 | 58 | 89 | 57 | 93 | 97 | 93 | 93 | 99 | 99 | 99 | 99 |
| Apache 3 | 195 | 100 | 195 | | | 92 | 92 | 92 | 92 | 95 | 74 | 96 | 71 | 91 | 91 | 91 | 91 |
| Cholla 1 | 119 | 100 | 119 | | | | 97 | | 97 | | 100 | | 100 | | 96 | | 96 |
| Cholla 2 | 350 | 100 | | 350 | | | | | | | | | | | | | |
| Four Corners 1 | 175 | 100 | 175 | | | | | | | | | | | | | | |
| Four Corners 2 | 175 | 100 | 175 | | | | | | | | | | | | | | |
| Four Corners 3 | 229 | 100 | 229 | | | | | | | | | | | | | | |
| Green 1 | 242 | 100 | | 242 | | | | | | | | | | | | | |
| Duck Creek 1 | 378 | 90 | 378 | | | 32 | 35 | 38 | 32 | 49 | 49 | 52 | 49 | | | | |
| Newton 1 | 617 | 100 | 617 | | | 52 | 46 | 54 | 45 | 53 | 39 | 40 | 39 | 36 | 34 | 37 | 34 |
| Craig 2 | 447 | 100 | 447 | | | | | | | | | | | | | | |
| Conesville 5 | 411 | 100 | 411 | | | 27 | 44 | 52 | 15 | 92 | 66 | 81 | 33 | 88 | 82 | 82 | 82 |
| Conesville 6 | 411 | 100 | 411 | | | 89 | 76 | 76 | 76 | 90 | 78 | 82 | 72 | 94 | 73 | 73 | 16 |
| Coal Creek 1 | 327 | 60 | 327 | | | | 100 | | 96 | | 100 | | 100 | | 100 | | 96 |
| Elrama 1-4 | 510 | 100 | 510 | | | 100 | 100 | 100 | 98 | 100 | 100 | 100 | 92 | | | | |
| Phillips 1-6 | 410 | 100 | 410 | | | 73 | 89 | 74 | 72 | 71 | 79 | 71 | 70 | | | | |
| Petersburg 3 | 532 | 100 | 532 | | | | | | | | | | | | | | |
| Hawthorn 3 | 90 | 100 | 90 | | | 100 | 100 | | 93 | 100 | 100 | | 100 | 100 | 100 | | 100 |
| Hawthorn 4 | 90 | 100 | | | 90 | 100 | | | 0 | 100 | | | 0 | 100 | | | 0 |
| La Cygne 1 | 874 | 100 | | 874 | | | | | | | | | | | | | |
| Jeffrey 1 | 540 | 75 | 540 | | | | | | | | | | | | | | |
| Lawrence 4 | 125 | 100 | 125 | | | | 100 | | 100 | | 100 | | 100 | | 100 | | 100 |
| Lawrence 5 | 420 | 100 | 420 | | | | 100 | | 100 | | 100 | | 52 | | 100 | | 55 |
| Green River 1-3 | 64 | 100 | | | 64 | 100 | | | 0 | 100 | | | 0 | 100 | | | 0 |
| Cane Run 4 | 188 | 100 | 188 | | | | 100 | | 96 | | 100 | | 67 | | 81 | | 74 |
| Cane Run 5 | 200 | 100 | 200 | | | | 92 | | 72 | | 72 | | 50 | | 45 | | 27 |
| Cane Run 6 | 299 | 100 | 299 | | | | 49 | | 14 | | 85 | | 47 | | 70 | | 65 |
| Mill Creek 3 | 442 | 100 | 442 | | | | | | 0 | | 36 | | 27 | | 37 | | 31 |
| Paddy's Run 6 | 72 | 100 | | | 72 | | | | 0 | | | | 0 | | | | 0 |

(continued)

TABLE III (continued)

| Plant | FGD system capacity, MW$^a$ | Flue gas % scrubbed | FGD capacity on line during period, MW$^{a,b}$ | No information for this period, MW$^a$ | Shut down throughout period, MW$^a$ | January 1980 Dependability %$^{c,e}$ | | | | February 1980 Dependability %$^{c,e}$ | | | | March 1980 Dependability %$^{c,e}$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AVL | OPR | REL | UTL | AVL | OPR | REL | UTL | AVL | OPR | REL | UTL |
| Milton R. Young 2 | 405 | 92 | 405 | | | 7 | 11 | 11 | 7 | 0 | 0 | | 0 | 29 | 29 | 29 | 29 |
| Colstrip 1 | 360 | 100 | | 360 | | | | | | | | | | | | | |
| Colstrip 2 | 360 | 100 | | 360 | | | | | | | | | | | | | |
| Reid Gardner 1 | 125 | 100 | 125 | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 66 | 84 | 85 | 34 |
| Reid Gardner 2 | 125 | 100 | 125 | | | 97 | 97 | 97 | 82 | 97 | 97 | 97 | 97 | 98 | 98 | 98 | 98 |
| Reid Gardner 3 | 125 | 100 | 125 | | | 100 | 100 | 100 | 91 | 78 | 98 | 78 | 78 | 60 | 100 | 100 | 60 |
| Dean H. Mitchell 11 | 115 | 100 | | 115 | | | | | | | | | | | | | |
| Sherburne 1 | 740 | 100 | 740 | | | 97 | | | | 97 | | | | 98 | | | |
| Sherburne 2 | 740 | 100 | 740 | | | 97 | | | | 96 | | | | 98 | | | |
| Jim Bridger 4 | 550 | 100 | 550 | | | | | | | | | | | | | | |
| Bruce Mansfield 1 | 917 | 100 | 917 | | | 98 | 100 | | 90 | 98 | 100 | | 94 | 98 | 100 | | 84 |
| Bruce Mansfield 2 | 917 | 100 | 917 | | | 97 | 100 | | 91 | 94 | 100 | | 100 | 98 | 100 | | 84 |
| Eddystone 1A | 120 | N/A$^d$ | | | 120 | | | | | | | | | | | | |
| San Juan 1 | 361 | 100 | 361 | | | 87 | 57 | | 47 | 67 | 65 | | 59 | 93 | 73 | | 26 |
| San Juan 2 | 350 | 100 | 350 | | | 31 | 21 | | 21 | 40 | 23 | | 26 | 57 | 31 | | 20 |
| San Juan 3 | 534 | 100 | 534 | | | | | | | | | | | | | | |
| Coronado 1 | 280 | 80 | 280 | | | | | | | | | | | | | | |
| Winyah 2 | 140 | 50 | 140 | | | | | | | | | | | | | | |
| R.D. Morrow 1 | 124 | 62 | 124 | | | 0 | | 0 | 0 | | | | | | | | |
| R.D. Morrow 2 | 124 | 62 | 124 | | | 0 | | 0 | 0 | | | | | | | | |
| Marion 4 | 184 | 100 | 184 | | | | 100 | | 10 | | 100 | | 31 | | 100 | | 48 |
| A.B. Brown 1 | 265 | 100 | 265 | | | 99 | 98 | 98 | 98 | 99 | 70 | 70 | 69 | 45 | 65 | 68 | 27 |
| Southwest 1 | 194 | 100 | 194 | | | 61 | 56 | 62 | 52 | 55 | 50 | 50 | 50 | 43 | 35 | 35 | 35 |
| G. F. Weaton 1 | 60 | N/A$^d$ | 60 | | | | | | | | | | | | | | |
| Shawnee 10A | 10 | N/A$^d$ | 10 | | | | | | | | | | | | | | |
| Shawnee 10B | 10 | N/A$^d$ | 10 | | | | | | | | | | | | | | |
| Widows Creek 8 | 550 | 100 | 550 | | | 70 | 90 | | 45 | 85 | 94 | | 77 | 87 | 79 | | 77 |
| Martin Lake 1 | 595 | 75 | 595 | | | | | | | | | | | | | | |
| Martin Lake 2 | 595 | 75 | 595 | | | | | | | | | | | | | | |

(continued)

TABLE III (continued)

| Plant | FGD system capacity, MW$^{a}$ | Flue gas % scrubbed | FGD capacity on line during period, MW$^{a,b}$ | No information for this period, MW$^{a}$ | Shut down throughout period, MW$^{a}$ | January 1980 Dependability %$^{c,e}$ | | | | February 1980 Dependability %$^{c,e}$ | | | | March 1980 Dependability %$^{c,e}$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AVL | OPN | REL | UTL | AVL | OPN | REL | UTL | AVL | OPN | REL | UTL |
| Martin Lake 3 | 595 | 75 | 595 | | | | | | | | | | | | | | |
| Monticello 3 | 800 | 100 | 800 | | | | | | | | | | | | | | |
| Hunter 1 | 360 | 90 | | 360 | | | | | | | | | | | | | |
| Huntington 1 | 366 | 85 | | 366 | | | | | | | | | | | | | |
| TOTAL | | | 18,208 | 3,546 | 346 | | | | | | | | | | | | |

[a] Equivalent scrubbed capacity.
[b] This category includes the flue gas capacity being handled by the FGD system at least part of the time during the report period.
[c] The percent figures listed are average values for all system scrubbing trains during the period.
[d] Flue gas % scrubbed for prototype and demonstration units is not applicable unless the system is designed to bring a unit into compliance with $SO_2$ emission standard.
[e] Availability, operability, reliability, and utilization as defined in Appendix C of this report.

As indicated in Table 1, 65 power generating units (all coal-fired) are now equipped with operating FGD systems. These units represent a total controlled capacity of 23,887 MW. Current projections indicate that the total power generating capacity of the U.S. electric utility industry will be approximately 931 GW by 1990.[a] (This value reflects the annual loss resulting from the retirement of older units, which is considered to be 0.4 percent of the average generating capacity at the end of each year.[b]) Approximately 382 GW or 41 percent of the 1990 total will come from coal-fired units. The distribution of power generation sources, both present (April 1979) and future (January 1990) is as follows:[a]

| | Coal | Nuclear | Oil | Hydro | Gas | Other | GW (total) |
|---|---|---|---|---|---|---|---|
| April 1979 | 39% | 9% | 26% | 12% | 13% | 1% | 588 |
| January 1990 | 41% | 22% | 18% | 10% | 8% | 1% | 931 |

Based on the known commitments to FGD by utilities as presented in Table 1, the percentage of electrical generating capacity controlled by FGD for both the present (March 1980) and the future (January 1990) is as follows:

| | % of coal-fired generating capacity | % of total generating capacity |
|---|---|---|
| March 1980* | 10.4 | 4.1 |
| January 1990 | 22.4 | 9.2 |

In light of the revised New Source Performance Standards, actual FGD control is expected to be greater than what is reflected by the figures above. For example, about 55 to 60 systems representing approximately 36,000 to 41,000 MW of generating capacity presently fall into the uncommitted category. These are systems that cannot be included in the committed group at this time because information regarding their status is not ready for public release.

In an effort to show general FCD usage and projected usage trends, the table below gives a current (March 1980) and a projected (January 1990) breakdown of throwaway product systems versus saleable product systems as a percent of the total known committments to FGD as of the end of the first quarter 1980:

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* The number of committed FGD systems is as of March 1980; however, the figure used for the total generating capacity and coal fired generating capacity is based on the available April 1979 figures.

| | Throwaway product process<br>% of total | | | Saleable product process<br>% of total | | | | Process undecided<br>% of total | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Lime | Limestone | Other | Sulfur | $H_2SO_4$ | Gypsum | N/A* | | |
| March 1980 | 28.1 | 39.4 | 25.5 | 4.0 | 3.0 | | | | 100 |
| January 1990 | 16.4 | 36.4 | 20.5 | 1.1 | 2.4 | 0.2 | 3.0 | 20.0 | 100 |

* N/A - not available (these systems will utilize a saleable product process but the byproduct is unknown at this time).

## HIGHLIGHTS: JANUARY - MARCH 1980

The following paragraphs highlight FGD system developments during the first quarter, 1980.

Tombigbee 2 of Alabama Electric Cooperative achieved availabilities of 90%, 99%, and 100% for the months of January, February, and March, respectively. The FGD system was unavailable only 69 hours in January due to a ruptured waste slurry line and an abraded expansion joint. No major FGD related problems were reported for February or March. The Tombigbee 3 FGD system had availabilities of 100% for both January and February; however, the Unit 3 boiler only operated for 24 hours in February. Unit 3 did not operate at all during March.

Arizona Electric Power Cooperative reported availabilities of 90%, 92%, and 99% for the Apache 2 FGD system during January, February, and March, respectively. The Apache 3 availabilities were 91%, 95%, and 91% for the same period. Most of the FGD system outage time reported was due to the malfunction of pumps.

The Cholla 1 FGD system of Arizona Public Service had operabilities of 97%, 100%, and 96% for the months of January, February, and March, respectively. No major FGD related problems were reported for the three month period although some outage time was required for repair of reheater ductwork.

Arizona Public Service announced during the period that modifications to the particle scrubbers at the Four Corners 1, 2, and 3 units were completed and the systems have begun operation in an $SO_2$ removal mode. Initially, the two Chemico venturi scrubbers designed for primary particle control at each unit were also removing approximately 30% of the $SO_2$ due to the alkalinity of the fly ash. These systems were modified to accommodate additional $SO_2$ removal (67.5%) by converting the scrubbers to lime/alkaline fly ash systems. Actual conversion of each system was completed in November 1979.

Basin Electric Power Coop announced that construction of the Laramie River 3 FGD system began during February 1980. Particle and $SO_2$ emissions at this 600 MW (gross) unit will be controlled by four lime/spray drying towers followed by a common ESP. The system is designed to remove 85 percent of the $SO_2$ before the flue gas exits through a 600 foot acid brick lined stack. Initial start up of the system is expected in July 1981.

Cincinnati Gas and Electric announced plans during the period for the installation of a second 650 MW (gross) generator at the East Bend power plant. The boiler will be identified as Unit 1 and will be required to meet an $SO_2$ emission standard of 0.84 lb/MMBtu. Currently, the utility is considering only FGD as a means of controlling the $SO_2$ emissions. The process type has not been selected and the projected start-up date of the unit has not been finalized.

No major FGD related problems were encountered during the first quarter, 1980 with the Conesville 6 FGD system of Columbus and Southern Ohio Electric. As a result, the unit had availabilities of 89%, 90%, and 94% for January, February, and March, respectively. The system utilization was only 16% in March due to an annual boiler/turbine inspection that began on March 9.

Cooperative Power Association reported FGD system utilization parameters of 96%, 100%, and 96% for January, February, and March, respectively. Some minor FGD outage time was reportedly caused by nozzle plugging and cracking which resulted in the unit operating at a reduced load for a short time in January. No major FGD related problems were reported for February or March.

Deseret Generation and Transmission Coop announced plans during the period for two new 410 MW (gross) units to be located in Vernal, Utah. The units will be designated as Moon Lake 1 and 2, and will burn coal with an average sulfur content of 0.5%. Currently, the utility is requesting/evaluating bids for limestone FGD systems to control $SO_2$ emissions from these two units. Baghouses will be used for primary particle removal. The FGD systems will operate in a closed water loop and the sludge generated will be disposed of in an on-site landfill. The expected start up of Unit 1 is December 1984. The start up date of Unit 2 is not finalized but is expected between 1987 and 1989.

Grand Haven Board of Light and Power announced that a contract has been awarded to Babcock and Wilcox for the installation of a lime FGD system at the new 81 MW (gross) J.B. Sims 3 unit. The boiler, which will be located in Grand Haven, Michigan, will fire coal with an average sulfur content of 2.75%. The FGD system will include two 100% capacity spray towers preceded by a cold side ESP for primary particle removal. Each spray tower will be equipped with a chevron mist eliminator and an in-line hot water reheater to boost the temperature of the flue gas before it exits through a 360 foot stack. Initial start up of this unit is expected in June 1983.

Michigan South Central Power Agency reported during the period that a contract has been awarded to Babcock and Wilcox for a limestone wet scrubbing system to control $SO_2$ emissions from the new Project 1 unit. The 55 MW (gross) boiler, which will be located in Litchfield, Michigan, will burn coal with an average sulfur content of 2.25%. The $SO_2$ removal equipment will consist of a spray tower system preceded by a hot side ESP for primary particle removal. Initial start up of the system is expected in July 1982.

A contract was awarded during the first quarter, 1980, to Research Cottrell by Muscatine Power and Water for the installation of a limestone FGD system at the new 166 MW (gross) Muscatine 9 unit. The Combustion Engineering boiler will burn coal with an average sulfur content of 3.17%. The FGD system will consist of three double loop combination towers, each with a spray tower lower stage and a "wetted film contactor" grid type upper stage (Research Cottrell design). Upstream of the FGD system will be a cold side ESP for primary particle removal. The system will operate in a closed water loop and the sludge will be disposed of in a landfill. The expected start up date is September 1982.

Nevada Power reported that the Reid Gardner 2 FGD system had an availability of 98% for all three months of the first quarter, 1980. Minor outages were reportedly caused by problems with the emergency spray system and the malfunctioning of ID fan controls.

Nevada Power began requesting/evaluating bids during the period for a system to control $SO_2$ emissions from the new unit scheduled for installation at the Reid Gardner station. The boiler will be identified as Unit 4 and will burn coal with an average sulfur content of 0.75%. Construction of the unit is expected to begin sometime in 1980 and initial start up is scheduled for April 1983.

New York State Electric and Gas began requesting/evaluating bids in February, 1980 for a limestone FGD system to be installed at the new 870 MW (gross) Somerset 1 unit. The boiler will fire a bituminous coal with an average sulfur content of 2.4%. The limestone absorber will be designed for a 90% $SO_2$ removal efficiency and will be preceded by a cold side ESP for particle removal. The sludge generated will be dewatered and stabilized before being landfilled. Expected start up of the system is June 1984.

At Sherburne 1 of Northern States Power the FGD system had availabilities of 97%, 97%, and 98% for the months of January, February, and March, respectively. The Sherburne 2 FGD system had availabilities of 97%, 96%, and 98% for the same period. No major FGD related problems were reported for either unit during the first quarter and both boilers achieved the highest gross generation to date in January.

Pennsylvania Power reported that the Bruce Mansfield 1 FGD system had availabilities of 98% for all three months of the first quarter, 1980. The Bruce Mansfield 2 availabilities were 97%, 94%, and 98% for January, February and March, respectively. No FGD related problems were reported for the three month period.

Philadelphia Electric announced during the period that construction has begun on the new magnesium oxide FGD system that is being installed at the Eddystone 1 unit. Operation of the prototype magnesium oxide system which treated one-third of the flue gas from the coal fired boiler has been terminated. The $SO_2$ removal equipment is being replaced with a similar magnesium oxide system designed to treat 100% of the boiler flue gas. The expected start up of the new system is December 1982. Current regulations do not require the utility to control $SO_2$ emissions from the Unit 1 boiler until the new FGD system is available for operation.

Construction is also underway on the FGD system being installed to control $SO_2$ emissions from the 334 MW (gross) Eddystone 2 boiler. This system will also be magnesium oxide and is being supplied by United Engineers. Expected start up is scheduled for December 1982.

Seminole Electric announced that contracts were awarded during February, 1980 to Peabody Process Systems for the installation of limestone FGD systems on the two new 620 MW (gross) Seminole 1 and Seminole 2 units located in Palatka, Florida. Each unit will be a pulverized coal boiler firing coal with an average sulfur content of 2.75%. Each FGD system will consist of five spray towers preceded by two ESP's for primary particle removal. One of the five modules for each system will be a spare. The expected start up dates for Units 1 and 2 are June 1983, and June 1985, respectively.

Tennessee Valley Authority announced that a contract has been awarded to Riley Stoker/Environeering for the installation of a magnesium oxide FGD system at the 1450 MW (gross) Johnsonville power station located in New Johnsonville, Tennessee. The system will consist of four venturi scrubber/absorber trains (one spare) and sulfuric acid will be produced as a byproduct. The equivalent of 600 MW of flue gas will be treated by the FGD system, with the remaining 60% of the gas being bypassed for reheat. Expected start up of this system is December 1981.

Tennessee Valley Authority also announced during the period that construction has begun on the FGD systems being installed on the Paradise 1 and 2 boilers. Each FGD system will consist of six trains, each train consisting of two venturis in series, the first for primary particle control and the second for primary $SO_2$ removal. Inlet flue gas will be used to heat water, which in turn will be used to reheat the outlet flue gas. The systems are being supplied by Chemico and are expected to start up in March 1982, and June 1982, for Units 1 and 2, respectively.

Texas Municipal Power Agency announced that construction began during the first quarter, 1980 on the FGD system being stalled at the Gibbons Creek station. The system is being installed on Unit 1, a new 400 MW (gross) boiler that will fire lignite with an average sulfur content of 1.06%. The emission control system will consist of a cold side ESP followed by three 50% capacity limestone spray towers. Also included will be a chevron mist eliminator and a steam coil reheat system downstream of each spray tower. The unit is expected to begin operation in January 1982.

United Power Association announced during the period that a contract has been awarded to Komline and Sanderson for the installation of a lime/spray drying FGD system at the new Stanton 2 unit. The boiler, which will be located in Stanton, North Dakota, will fire lignite with an average sulfur content of 0.77%. The FGD system will consist of a spray dryer tower followed by a fabric filter for the removal of the spent reagent and particulate matter. The cleaned flue gas will exit to the atmosphere through a 254 foot concrete stack. Expected start up of this unit is January 1982.

Wisconsin Power and Light announced that plans for the installation of an FGD system at the Columbia 2 unit have been dropped. The utility will be utilizing a low sulfur coal at this unit in order to comply with the applicable $SO_2$ emission standard.

## REFERENCE

a. U.S. Department of Energy. Energy Information Administration. Office of Energy Data Interpretation. Division of Coal Power Statistics. Inventory of Power Plants in the United States, April 1979. Pub. No. DOE/EIA-0095.

b. Rittenhouse, R.C. New Generating Capacity: When, Where, and By Whom. Power Engineering 82(4):57. April 1978.

## EPA UTILITY FGD SURVEY: JANUARY - MARCH 1982

### SECTION 1
### SUMMARY LIST OF FGD SYSTEMS

| COMPANY NAME/ UNIT NAME | UNIT NO. | UNIT LOCATION | | START-UP DATE | STATUS | REG CLASS |
|---|---|---|---|---|---|---|
| ALABAMA ELECTRIC COOP | | | | | | |
| TOMBIGBEE | 2 | LEROY | ALABAMA | 9/78 | 1 | B |
| TOMBIGBEE | 3 | LEROY | ALABAMA | 6/79 | 1 | B |
| ALLEGHENY POWER SYSTEM | | | | | | |
| MITCHELL | 33 | COURTNEY | PENNSYLVANIA | 8/82 | 3 | C |
| PLEASANTS | 1 | BELMONT | WEST VIRGINIA | 3/79 | 1 | B |
| PLEASANTS | 2 | BELMONT | WEST VIRGINIA | 9/80 | 2 | B |
| ARIZONA ELECTRIC POWER COOP | | | | | | |
| APACHE | 2 | COCHISE | ARIZONA | 8/78 | 1 | D |
| APACHE | 3 | COCHISE | ARIZONA | 6/79 | 1 | D |
| ARIZONA PUBLIC SERVICE | | | | | | |
| CHOLLA | 1 | JOSEPH CITY | ARIZONA | 10/73 | 1 | C |
| CHOLLA | 2 | JOSEPH CITY | ARIZONA | 4/78 | 1 | C |
| CHOLLA | 4 | JOSEPH CITY | ARIZONA | 6/80 | 2 | C |
| FOUR CORNERS | 1 | FARMINGTON | NEW MEXICO | 11/79 | 1 | C |
| FOUR CORNERS | 2 | FARMINGTON | NEW MEXICO | 11/79 | 1 | C |
| FOUR CORNERS | 3 | FARMINGTON | NEW MEXICO | 11/79 | 1 | C |
| FOUR CORNERS | 4 | FARMINGTON | NEW MEXICO | 0/82 | 3 | C |
| FOUR CORNERS | 5 | FARMINGTON | NEW MEXICO | 0/82 | 3 | C |
| ASSOCIATED ELECTRIC COOP | | | | | | |
| THOMAS HILL | 3 | MOBERLY | MISSOURI | 1/82 | 2 | A |
| BASIN ELECTRIC POWER COOP | | | | | | |
| ANTELOPE VALLEY | 1 | BEULAH | NORTH DAKOTA | 4/82 | 2 | D |
| ANTELOPE VALLEY | 2 | BEULAH | NORTH DAKOTA | 4/84 | 5 | C |
| LARAMIE RIVER | 1 | WHEATLAND | WYOMING | 4/80 | 2 | C |
| LARAMIE RIVER | 2 | WHEATLAND | WYOMING | 11/80 | 2 | C |
| LARAMIE RIVER | 3 | WHEATLAND | WYOMING | 4/82 | 2 | C |
| BIG RIVERS ELECTRIC | | | | | | |
| D. B. WILSON | 1 | | | 0/84 | 6 | A |
| D. B. WILSON | 2 | | | 0/85 | 6 | A |
| GREEN | 1 | SEBREE | KENTUCKY | 12/79 | 1 | B |
| GREEN | 2 | SEBREE | KENTUCKY | 11/80 | 2 | B |
| CENTRAL ILLINOIS LIGHT | | | | | | |
| DUCK CREEK | 1 | CANTON | ILLINOIS | 7/76 | 1 | B |
| DUCK CREEK | 2 | CANTON | ILLINOIS | 1/86 | 5 | A |
| CENTRAL ILLINOIS PUBLIC SERV | | | | | | |
| NEWTON | 1 | NEWTON | ILLINOIS | 9/79 | 1 | B |
| CENTRAL MAINE POWER | | | | | | |
| SEARS ISLAND | 1 | PENOBSCOT BAY | MAINE | 1/89 | 6 | A |
| CINCINNATI GAS & ELECTRIC | | | | | | |
| EAST BEND | 1 | RABBITHASH | KENTUCKY | 0/ 0 | 6 | |
| EAST BEND | 2 | RABBITHASH | KENTUCKY | 9/80 | 2 | B |
| COLORADO UTE ELECTRIC ASSN. | | | | | | |
| CRAIG | 1 | CRAIG | COLORADO | 4/80 | 2 | D |
| CRAIG | 2 | CRAIG | COLORADO | 8/79 | 1 | D |
| CRAIG | 3 | CRAIG | COLORADO | 0/82 | 6 | D |
| COLUMBUS & SOUTHERN OHIO ELEC. | | | | | | |
| CONESVILLE | 5 | CONESVILLE | OHIO | 1/77 | 1 | D |
| CONESVILLE | 6 | CONESVILLE | OHIO | 6/78 | 1 | D |

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
5. PLANNED - REQUESTING/EVALUATING BIDS
6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. FEDERAL NSPS(6/79)
B. FEDERAL NSPS(12/71)
C. STANDARD(S) MORE STRINGENT THAN NSPS(6/79)
D. STANDARD(S) MORE STRINGENT THAN NSPS(12/71) BUT NOT MORE STRINGENT THAN NSPS(6/79)
E. STANDARD(S) EQUAL TO OR LESS STRINGENT THAN NSPS(12/71)

## SECTION 1
## SUMMARY LIST OF FGD SYSTEMS

| COMPANY NAME/ UNIT NAME | UNIT NO. | UNIT LOCATION | | START-UP DATE | STATUS | REG CLASS |
|---|---|---|---|---|---|---|
| COLUMBUS & SOUTHERN OHIO ELEC. | | | | | | |
| POSTON | 5 | NELSONVILLE | OHIO | 8/86 | 6 | D |
| POSTON | 6 | NELSONVILLE | OHIO | 0/89 | 6 | D |
| COMMONWEALTH EDISON | | | | | | |
| POWERTON | 51 | PERKIN | ILLINOIS | 4/80 | 2 | E |
| COOPERATIVE POWER ASSOCIATION | | | | | | |
| COAL CREEK | 1 | UNDERWOOD | NORTH DAKOTA | 8/79 | 1 | B |
| COAL CREEK | 2 | UNDERWOOD | NORTH DAKOTA | 7/80 | 2 | B |
| DELMARVA POWER & LIGHT | | | | | | |
| DELAWARE CITY | 1-3 | DELAWARE CITY | DELAWARE | 4/80 | 2 | E |
| VIENNA | 9 | VIENNA | MARYLAND | 6/87 | 6 | A |
| DESERET GENERATION & TRANS COO | | | | | | |
| MOON LAKE | 1 | VERNAL | UTAH | 12/84 | 5 | A |
| MOON LAKE | 2 | VERNAL | UTAH | 0/88 | 5 | A |
| DUQUESNE LIGHT | | | | | | |
| ELRAMA | 1-4 | ELRAMA | PENNSYLVANIA | 10/75 | 1 | D |
| PHILLIPS | 1-6 | SOUTH HEIGHT | PENNSYLVANIA | 7/73 | 1 | D |
| EAST KENTUCKY POWER COOP | | | | | | |
| J. K. SMITH | 1 | | | 1/85 | 6 | A |
| J. K. SMITH | 2 | | | 1/87 | 6 | A |
| SPURLOCK | 2 | MAYSVILLE | KENTUCKY | 1/81 | 2 | B |
| GENERAL PUBLIC UTILITIES | | | | | | |
| COHO | 1 | GIRARD TWP. | PENNSYLVANIA | 12/88 | 6 | A |
| GILBERT | 1 | MILFORD | NEW JERSEY | 0/90 | 6 | A |
| SCOTTSVILLE | 1 | SCOTTSVILLE | PENNSYLVANIA | 0/91 | 6 | A |
| SEWARD | 7 | E. WHEATFIELD T | PENNSYLVANIA | 5/87 | 6 | A |
| WEHRUM | 1 | WEHRUM | PENNSYLVANIA | 0/95 | 6 | A |
| GRAND HAVEN BRD OF LIGHT & PWR | | | | | | |
| J. B. SIMS | 3 | GRAND HAVEN | MICHIGAN | 6/83 | 3 | A |
| HOOSIER ENERGY | | | | | | |
| MEROM | 1 | SULLIVAN | INDIANA | 5/82 | 3 | B |
| MEROM | 2 | SULLIVAN | INDIANA | 7/81 | 2 | B |
| HOUSTON LIGHTING & POWER CO. | | | | | | |
| W.A. PARISH | 8 | BOOTH | TEXAS | 11/82 | 3 | A |
| INDIANAPOLIS POWER & LIGHT | | | | | | |
| PATRIOT | 1 | PATRIOT | INDIANA | 0/87 | 6 | C |
| PATRIOT | 2 | PATRIOT | INDIANA | 0/87 | 6 | C |
| PATRIOT | 3 | PATRIOT | INDIANA | 0/87 | 6 | C |
| PETERSBURG | 3 | PETERSBURG | INDIANA | 12/77 | 1 | B |
| PETERSBURG | 4 | PETERSBURG | INDIANA | 10/84 | 2 | B |
| KANSAS CITY POWER & LIGHT | | | | | | |
| HAWTHORN | 3 | KANSAS CITY | MISSOURI | 11/72 | 1 | D |
| HAWTHORN | 4 | KANSAS CITY | MISSOURI | 8/72 | 1 | D |
| LA CYGNE | 1 | LA CYGNE | KANSAS | 2/73 | 1 | E |
| KANSAS POWER & LIGHT | | | | | | |
| JEFFREY | 1 | WAMEGO | KANSAS | 8/78 | 1 | D |
| JEFFREY | 2 | WAMEGO | KANSAS | 4/80 | 2 | D |
| LAWRENCE | 4 | LAWRENCE | KANSAS | 1/76 | 1 | D |

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
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6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. FEDERAL NSPS(6/79)
B. FEDERAL NSPS(12/71)
C. STANDARD(S) MORE STRINGENT THAN NSPS(6/79)
D. STANDARD(S) MORE STRINGENT THAN NSPS(12/71) BUT NOT MORE STRINGENT THAN NSPS(6/79)
E. STANDARD(S) EQUAL TO OR LESS STRINGENT THAN NSPS(12/71)

## SECTION 1
## SUMMARY LIST OF FGD SYSTEMS

| COMPANY NAME/ UNIT NAME | UNIT NO. | UNIT LOCATION | | START-UP DATE | STATUS | REG CLASS |
|---|---|---|---|---|---|---|
| KANSAS POWER & LIGHT | | | | | | |
| LAWRENCE | 5 | LAWRENCE | KANSAS | 11/71 | 1 | D |
| KENTUCKY UTILITIES | | | | | | |
| GREEN RIVER | 1-3 | CENTRAL CITY | KENTUCKY | 9/75 | 1 | E |
| LAKELAND UTILITIES | | | | | | |
| MCINTOSH | 3 | LAKELAND | FLORIDA | 10/81 | 2 | A |
| LOUISVILLE GAS & ELECTRIC | | | | | | |
| CANE RUN | 4 | LOUISVILLE | KENTUCKY | 8/76 | 1 | D |
| CANE RUN | 5 | LOUISVILLE | KENTUCKY | 12/77 | 1 | D |
| CANE RUN | 6 | LOUISVILLE | KENTUCKY | 4/79 | 1 | D |
| MILL CREEK | 1 | LOUISVILLE | KENTUCKY | 4/81 | 2 | E |
| MILL CREEK | 2 | LOUISVILLE | KENTUCKY | 4/82 | 2 | E |
| MILL CREEK | 3 | LOUISVILLE | KENTUCKY | 8/78 | 1 | D |
| MILL CREEK | 4 | LOUISVILLE | KENTUCKY | 7/81 | 2 | B |
| PADDY'S RUN | 6 | LOUISVILLE | KENTUCKY | 4/73 | 1 | E |
| TRIMBLE COUNTY | 1 | BEDFORD | KENTUCKY | 7/84 | 6 | A |
| TRIMBLE COUNTY | 2 | BEDFORD | KENTUCKY | 7/86 | 6 | A |
| MICHIGAN SO. CENTRAL PWR AGENC | | | | | | |
| PROJECT | 1 | LITCHFIELD | MICHIGAN | 7/83 | 3 | |
| MIDDLE SOUTH UTILITIES | | | | | | |
| ARKANSAS COAL | 5 | | ARKANSAS | 1/86 | 5 | A |
| ARKANSAS COAL | 6 | | ARKANSAS | 1/88 | 5 | A |
| LOUISIANA COAL | 1 | | LOUISIANA | 0/86 | 5 | A |
| LOUISIANA COAL | 2 | | LOUISIANA | 0/88 | 5 | A |
| MISSISSIPPI COAL | 1 | | MISSISSIPPI | 0/85 | 5 | A |
| MISSISSIPPI COAL | 2 | | MISSISSIPPI | 0/87 | 5 | A |
| MINNESOTA POWER & LIGHT | | | | | | |
| CLAY BOSWELL | 4 | COHASSET | MINNESOTA | 4/80 | 2 | B |
| MINNKOTA POWER COOPERATIVE | | | | | | |
| MILTON R. YOUNG | 2 | CENTER | NORTH DAKOTA | 9/77 | 1 | D |
| MONTANA POWER | | | | | | |
| COLSTRIP | 1 | COLSTRIP | MONTANA | 9/75 | 1 | B |
| COLSTRIP | 2 | COLSTRIP | MONTANA | 5/76 | 1 | B |
| COLSTRIP | 3 | COLSTRIP | MONTANA | 1/84 | 2 | C |
| COLSTRIP | 4 | COLSTRIP | MONTANA | 0/84 | 2 | C |
| MUSCATINE POWER & WATER | | | | | | |
| MUSCATINE | 9 | MUSCATINE | IOWA | 9/82 | 3 | B |
| NEVADA POWER | | | | | | |
| HARRY ALLEN | 1 | N.E. LAS VEGAS | NEVADA | 6/86 | 6 | A |
| HARRY ALLEN | 2 | N.E. LAS VEGAS | NEVADA | 6/87 | 6 | A |
| HARRY ALLEN | 3 | N.E. LAS VEGAS | NEVADA | 6/88 | 6 | A |
| HARRY ALLEN | 4 | N.E. LAS VEGAS | NEVADA | 6/89 | 6 | A |
| REID GARDNER | 1 | MOAPA | NEVADA | 4/74 | 1 | B |
| REID GARDNER | 2 | MOAPA | NEVADA | 4/74 | 1 | B |
| REID GARDNER | 3 | MOAPA | NEVADA | 6/76 | 1 | B |
| REID GARDNER | 4 | MOAPA | NEVADA | 4/83 | 5 | A |
| WARNER VALLEY | 1 | ST. GEORGE | UTAH | 6/85 | 6 | A |
| WARNER VALLEY | 2 | ST. GEORGE | UTAH | 6/86 | 6 | A |

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6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
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A. FEDERAL NSPS(6/79)
B. FEDERAL NSPS(12/71)
C. STANDARD(S) MORE STRINGENT THAN NSPS(6/79)
D. STANDARD(S) MORE STRINGENT THAN NSPS(12/71) BUT NOT MORE STRINGENT THAN NSPS(6/79)
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## SECTION 1
## SUMMARY LIST OF FGD SYSTEMS

| COMPANY NAME/ UNIT NAME | UNIT NO. | UNIT LOCATION | | START-UP DATE | STATUS | REG CLASS |
|---|---|---|---|---|---|---|
| NEW YORK STATE ELEC & GAS | | | | | | |
| SOMERSET | 1 | SOMERSET | NEW YORK | 6/84 | 5 | E |
| NIAGARA MOHAWK POWER COOP | | | | | | |
| CHARLES R. HUNTLEY | 66 | BUFFALO | NEW YORK | 4/82 | 2 | E |
| NORTHERN INDIANA PUB SERVICE | | | | | | |
| DEAN H. MITCHELL | 11 | GARY | INDIANA | 7/76 | 1 | E |
| SCHAHFER | 17 | WHEATFIELD | INDIANA | 6/83 | 4 | A |
| SCHAHFER | 18 | WHEATFIELD | INDIANA | 6/85 | 4 | A |
| NORTHERN STATES POWER | | | | | | |
| RIVERSIDE | 6,7 | MINNEAPOLIS | MINNESOTA | 7/80 | 2 | E |
| SHERBURNE | 1 | BECKER | MINNESOTA | 3/76 | 1 | D |
| SHERBURNE | 2 | BECKER | MINNESOTA | 4/77 | 1 | D |
| SHERBURNE | 3 | BECKER | MINNESOTA | 5/84 | 5 | C |
| OTTER TAIL POWER | | | | | | |
| COYOTE | 1 | BEULAH | NORTH DAKOTA | 3/81 | 2 | E |
| PACIFIC GAS & ELECTRIC | | | | | | |
| MONTEZUMA | 1 | COLLINSVILLE | CALIFORNIA | 6/87 | 6 | C |
| MONTEZUMA | 2 | COLLINSVILLE | CALIFORNIA | 6/88 | 6 | C |
| PACIFIC POWER & LIGHT | | | | | | |
| JIM BRIDGER | 4 | ROCK SPRINGS | WYOMING | 9/79 | 1 | D |
| PENNSYLVANIA POWER | | | | | | |
| BRUCE MANSFIELD | 1 | SHIPPINGPORT | PENNSYLVANIA | 12/75 | 1 | D |
| BRUCE MANSFIELD | 2 | SHIPPINGPORT | PENNSYLVANIA | 7/77 | 1 | D |
| BRUCE MANSFIELD | 3 | SHIPPINGPORT | PENNSYLVANIA | 10/80 | 2 | D |
| PHILADELPHIA ELECTRIC | | | | | | |
| CROMBY | | PHOENIXVILLE | PENNSYLVANIA | 12/82 | 3 | D |
| EDDYSTONE | 1A | EDDYSTONE | PENNSYLVANIA | 9/75 | 1 | D |
| EDDYSTONE | 1B | EDDYSTONE | PENNSYLVANIA | 12/82 | 2 | D |
| EDDYSTONE | 2 | EDDYSTONE | PENNSYLVANIA | 12/82 | 2 | D |
| POTOMAC ELECTRIC POWER | | | | | | |
| DICKERSON | 4 | DICKERSON | MARYLAND | 5/87 | 6 | A |
| PUBLIC SERVICE INDIANA | | | | | | |
| GIBSON | 5 | PRINCETON | INDIANA | 0/82 | 3 | B |
| PUBLIC SERVICE OF NEW MEXICO | | | | | | |
| SAN JUAN | 1 | WATERFLOW | NEW MEXICO | 4/78 | 1 | C |
| SAN JUAN | 2 | WATERFLOW | NEW MEXICO | 8/78 | 1 | C |
| SAN JUAN | 3 | WATERFLOW | NEW MEXICO | 12/79 | 1 | C |
| SAN JUAN | 4 | WATERFLOW | NEW MEXICO | 6/82 | 2 | C |
| PWR AUTHORITY OF STATE OF NY | | | | | | |
| FOSSIL | | NEW YORK | NEW YORK | 11/87 | 6 | C |
| SALT RIVER PROJECT | | | | | | |
| CORONADO | 1 | ST. JOHNS | ARIZONA | 11/79 | 1 | D |
| CORONADO | 2 | ST. JOHNS | ARIZONA | 7/80 | 2 | D |
| CORONADO | 3 | ST. JOHNS | ARIZONA | 6/87 | 6 | A |
| SAN MIGUEL ELECTRIC COOP | | | | | | |
| SAN MIGUEL | 1 | SAN MIGUEL | TEXAS | 9/80 | 2 | B |

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|---|---|---|---|---|---|---|
| SEMINOLE ELECTRIC | | | | | | |
| SEMINOLE | 1 | PALATKA | FLORIDA | 3/83 | 3 | A |
| SEMINOLE | 2 | PALATKA | FLORIDA | 3/85 | 3 | A |
| SIKESTON BOARD OF MUNIC. UTIL. | | | | | | |
| SIKESTON | 1 | SIKESTON | MISSOURI | 1/81 | 2 | B |
| SOUTH CAROLINA PUBLIC SERVICE | | | | | | |
| WINYAH | 2 | GEORGETOWN | SOUTH CAROLINA | 7/77 | 1 | B |
| WINYAH | 3 | GEORGETOWN | SOUTH CAROLINA | 5/80 | 2 | B |
| WINYAH | 4 | GEORGETOWN | SOUTH CAROLINA | 7/81 | 3 | A |
| SOUTH MISSISSIPPI ELEC PWR | | | | | | |
| R.D. MORROW | 1 | HATTISBURG | MISSISSIPPI | 8/78 | 1 | B |
| R.D. MORROW | 2 | HATTISBURG | MISSISSIPPI | 6/79 | 1 | B |
| SOUTHERN ILLINOIS POWER COOP | | | | | | |
| MARION | 4 | MARION | ILLINOIS | 5/79 | 1 | B |
| MARION | 5 | MARION | ILLINOIS | 0/86 | 6 | A |
| SOUTHERN INDIANA GAS & ELEC | | | | | | |
| A.B. BROWN | 1 | WEST FRANKLIN | INDIANA | 4/79 | 1 | B |
| SOUTHWESTERN ELECTRIC POWER | | | | | | |
| HENRY W. PIRKEY | 1 | HALLSVILLE | TEXAS | 12/84 | 3 | B |
| SPRINGFIELD CITY UTILITIES | | | | | | |
| SOUTHWEST | 1 | SPRINGFIELD | MISSOURI | 4/77 | 1 | B |
| SPRINGFIELD WATER, LIGHT & PWR | | | | | | |
| DALLMAN | 3 | SPRINGFIELD | ILLINOIS | 11/80 | 2 | B |
| ST. JOE ZINC | | | | | | |
| G.F. WEATON | 1 | MONACA | PENNSYLVANIA | 11/79 | 1 | B |
| TAMPA ELECTRIC | | | | | | |
| BIG BEND | 4 | TAMPA | FLORIDA | 3/85 | 5 | A |
| TENNESSEE VALLEY AUTHORITY | | | | | | |
| JOHNSONVILLE | 1-10 | NEW JOHNSONVILL | TENNESSEE | 12/81 | 3 | E |
| PARADISE | 1 | PARADISE | KENTUCKY | 3/82 | 2 | E |
| PARADISE | 2 | PARADISE | KENTUCKY | 6/82 | 2 | E |
| SHAWNEE | 10A | PADUCAH | KENTUCKY | 4/72 | 1 | E |
| SHAWNEE | 10B | PADUCAH | KENTUCKY | 4/72 | 1 | E |
| WIDOWS CREEK | 7 | BRIDGEPORT | ALABAMA | 9/81 | 2 | E |
| WIDOWS CREEK | 8 | BRIDGEPORT | ALABAMA | 5/77 | 1 | E |
| TEXAS MUNICIPAL POWER AGENCY | | | | | | |
| GIBBONS CREEK | 1 | CARLOS | TEXAS | 1/82 | 2 | A |
| TEXAS POWER & LIGHT | | | | | | |
| SANDOW | 4 | ROCKDALE | TEXAS | 7/80 | 2 | B |
| TWIN OAKS | 1 | BREMOND | TEXAS | 8/84 | 3 | A |
| TWIN OAKS | 2 | BREMOND | TEXAS | 8/85 | 3 | A |
| TEXAS UTILITIES | | | | | | |
| FOREST GROVE | 1 | ATHENS | TEXAS | 0/81 | 5 | A |
| MARTIN LAKE | 1 | TATUM | TEXAS | 4/77 | 1 | B |
| MARTIN LAKE | 2 | TATUM | TEXAS | 5/78 | 1 | B |
| MARTIN LAKE | 3 | TATUM | TEXAS | 2/79 | 1 | B |
| MARTIN LAKE | 4 | TATUM | TEXAS | 0/85 | 3 | A |

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## SECTION 1
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|---|---|---|---|---|---|---|
| TEXAS UTILITIES | | | | | | |
| MILL CREEK | 1 | HENDERSON | TEXAS | 0/85 | 6 | A |
| MILL CREEK | 2 | HENDERSON | TEXAS | 0/86 | 6 | A |
| MONTICELLO | 3 | MT. PLEASANT | TEXAS | 5/78 | 1 | B |
| TUCSON ELECTRIC POWER | | | | | | |
| SPRINGERVILLE | 1 | SPRINGERVILLE | ARIZONA | 6/85 | 3 | B |
| SPRINGERVILLE | 2 | SPRINGERVILLE | ARIZONA | 1/87 | 3 | B |
| UNITED POWER ASSOCIATION | | | | | | |
| STANTON | 2 | STANTON | NORTH DAKOTA | 1/82 | 3 | A |
| UTAH POWER & LIGHT | | | | | | |
| HUNTER | 1 | CASTLE DALE | UTAH | 5/79 | 1 | B |
| HUNTER | 2 | CASTLE DALE | UTAH | 6/80 | 2 | B |
| HUNTER | 3 | CASTLE DALE | UTAH | 0/83 | 3 | A |
| HUNTER | 4 | CASTLE DALE | UTAH | 0/85 | 3 | A |
| HUNTINGTON | 1 | PRICE | UTAH | 5/78 | 1 | B |

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## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| ALABAMA ELECTRIC COOP<br>TOMBIGBEE<br>2<br>NEW 255.0 MW (GROSS)<br>179.0 MW (ESC)<br>COAL<br>1.15 %S BITUMINOUS<br>LIMESTONE<br>PEABODY PROCESS SYSTEMS<br>ENERGY CONSUMPTION: 3.1%<br>STATUS 1 STARTUP 9/78 | TOMBIGBEE 2 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.2% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO2 EMMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE MATTER CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED FOR EACH TOWER AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID-BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND SPENT ABSORBENT IS DISPOSED OF IN AN ON-SITE LINED POND. |
| ALABAMA ELECTRIC COOP<br>TOMBIGBEE<br>3<br>NEW 255.0 MW (GROSS)<br>179.0 MW (ESC)<br>COAL<br>1.15 %S BITUMINOUS<br>LIMESTONE<br>PEABODY PROCESS SYSTEMS<br>ENERGY CONSUMPTION: 3.1%<br>STATUS 1 STARTUP 6/79 | TOMBIGBEE 3 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.2% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO2 EMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED IN EACH TOWER, AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND SPENT ABSORBENT IS DISPOSED IN AN ON-SITE LINED POND. |
| ALLEGHENY POWER SYSTEM<br>MITCHELL<br>33<br>RETROFIT 300.0 MW (GROSS)<br>300.0 MW (ESC)<br>COAL<br>2.80 %S BITUMINOUS<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: 1.1%<br>STATUS 3 STARTUP 8/82 | UNIT 33 AT ALLEGHENY POWER SYSTEM'S MITCHELL POWER STATION IN COURTNEY, PENNSYLVANIA IS A 2.8% SULFUR COAL FIRED BOILER. A CONTRACT WAS AWARDED TO CHEMICO FOR A LIME SCRUBBING PROCESS. SO2 REMOVAL EFFICIENCY WILL BE 95%. START UP IS PLANNED FOR AUGUST OF 1982. |
| ALLEGHENY POWER SYSTEM<br>PLEASANTS<br>1<br>NEW 625.0 MW (GROSS)<br>519.0 MW (ESC)<br>COAL<br>3.70 %S BITUMINOUS<br>LIME<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 3/79 | ALLEGHENY POWER SYSTEM'S PLEASANTS 1 IS A BITUMINOUS COAL (3.70% S, 12,150 BTU/LB) FIRED BOILER IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX SUPPLIED A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE FLUE GAS SO2 FROM THIS UNIT. THE EMISSION CONTROL SYSTEM INCLUDES AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM PROVIDES REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. THE FGD SYSTEM ON THIS UNIT HAS BEEN OPERATIONAL SINCE MARCH OF 1979. |
| ALLEGHENY POWER SYSTEM<br>PLEASANTS<br>2<br>NEW 625.0 MW (GROSS)<br>519.0 MW (ESC)<br>COAL<br>4.50 %S BITUMINOUS<br>LIME<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 9/80 | ALLEGHENY POWER SYSTEM'S PLEASANTS 2 IS A BITUMINOUS COAL (3.7% S, 12,150 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX IS SUPPLYING A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE BOILER FLUE GAS SO2. THE EMISSION CONTROL SYSTEM ON THIS UNIT WILL INCLUDE AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM WILL PROVIDE REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP. FGD SYSTEM START UP IS EXPECTED IN SEPTEMBER, 1980. |
| ARIZONA ELECTRIC POWER COOP<br>APACHE<br>2<br>NEW 195.0 MW (GROSS)<br>195.0 MW (ESC)<br>COAL<br>.55 %S BITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 4.1%<br>STATUS 1 STARTUP 8/78 | APACHE 2 OF ARIZONA ELECTRIC POWER COOP IS LOCATED IN COCHISE, ARIZONA AND IS A DRY BOTTOM PULVERIZED COAL FIRED UNIT WITH A FLUE GAS FLOW OF 735,000 ACFM. BITUMINOUS COAL WITH A HEATING VALUE OF 10,000 BTU/LB, A SULFUR CONTENT OF 0.7% AND AN ASH CONTENT OF 15% IS THE FUEL USED FOR THIS UNIT. PARTICULATE CONTROL IS EFFECTED BY A HOT SIDE ESP. THE UNIT IS CURRENTLY IN OPERATION WITH STARTUP IN AUGUST 1978. TWO PACKED TOWERS EMPLOYING LIMESTONE ABSORBENT AND HAVING A DESIGN SO2 REMOVAL OF 85% WERE SUPPLIED BY RESEARCH COTTRELL MIST ELIMINATION IS PROVIDED BY CHEVRON TYPE ELIMINATORS. NO REHEAT IS EMPLOYED. A 400 FT COLE BRAND CXL2000 LINED STACK IS IN USE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND WASTE MATERIAL IS DISPOSED OF IN OFF-SITE SLUDGE PONDS. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| ARIZONA ELECTRIC POWER COOP<br>APACHE<br>3<br>NEW 195.0 MW (GROSS)<br>195.0 MW (ESC)<br>COAL<br>.55 %S BITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 4.1%<br>STATUS 1 STARTUP 6/79 | APACHE 3 OF ARIZONA ELECTRIC POWER COOP IS A DRY BOTTOM, PULVERIZED COAL FIRED UNIT IN COCHISE, ARIZONA. LOW (0.7%) SULFUR BITUMINOUS COAL WITH AN AVERAGE HEATING VALUE OF 10,000 BTU/LB PRODUCES A MAXIMUM FLUE GAS FLOW OF 735,000 ACFM. THE FLUE GAS PASSES THROUGH A HOT SIDE ESP TO TWO RESEARCH COTTRELL PACKED TOWERS, WHERE LIMESTONE IS USED TO REMOVE 85% (DESIGN) OF THE SO2. THE GAS EXITS A HORIZONTAL CHEVRON MIST ELIMINATOR INTO ITS OWN CEILCOTE LINED FLUE IN THE 400 FOOT STACK IT SHARES WITH UNIT 2. THE FGD, WHICH HAS BEEN OPERATIONAL SINCE JUNE OF 1979, USES NO REHEAT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP AND SLUDGE IS DISPOSED OF IN TWO OFF SITE LINED PONDS WITH 20 YEARS' EXPECTED LIFESPAN. TWO ADDITIONAL PONDS ARE PLANNED, WHICH WOULD ADD ANOTHER 20 YEARS' CAPACITY. |
| ARIZONA PUBLIC SERVICE<br>CHOLLA<br>1<br>RETROFIT 119.0 MW (GROSS)<br>119.0 MW (ESC)<br>COAL<br>.50 %S BITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 3.4%<br>STATUS 1 STARTUP 10/73 | ARIZONA PUBLIC SERVICE'S CHOLLA 1 IS LOCATED IN JOSEPH CITY, ARIZONA AND IS A TANGENTIALLY FIRED, WET BOTTOM PULVERIZED COAL UNIT. IT IS FUELED BY BITUMINOUS COAL THAT HAS A SULFUR CONTENT OF 0.5% AND A HEATING VALUE OF 10,150 BTU/LB. PARTICULATE MATTER IS CONTROLLED BY TWO FLOODED DISC SCRUBBERS. THE FGD SYSTEM BEGAN IN OCTOBER, 1973 AND IS NOW OPERATIONAL. SO2 IS CONTROLLED BY ONE TOWER WITH MUNTERS PACKING EMPLOYING A LIMESTONE ABSORBENT. THE UNIT WAS SUPPLIED BY RESEARCH COTTRELL AND HAS A DESIGN REMOVAL OF 92%. CHEVRON MIST ELIMINATORS ARE LOCATED PRIOR TO AN IN-LINE STEAM REHEAT SYSTEM. THE TREATED FLUE GAS IS VENTED TO A 256 FT ACID BRICK LINED STACK. THE FGD SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND THE UNTREATED WASTE IS DISPOSED OF IN AN ON-SITE UNLINED POND. |
| ARIZONA PUBLIC SERVICE<br>CHOLLA<br>2<br>NEW 350.0 MW (GROSS)<br>350.0 MW (ESC)<br>COAL<br>.50 %S BITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 4/78 | CHOLLA 2 OF ARIZONA PUBLIC SERVICE IS LOCATED IN JOSEPH CITY, ARIZONA. THE BOILER BURNS PULVERIZED BITUMINOUS COAL (0.5% S, 10,150 BTU/LB). MECHANICAL COLLECTORS PROVIDE PRIMARY PARTICULATE CONTROL. FOUR PARALLEL FLOODED DISC AND PACKED TOWER SO2 ABSORBER TRAINS (THREE ARE REQUIRED FOR FULL LOAD) REMOVE THE FLUE GAS SO2. THE DESIGN SO2 REMOVAL FOR THE SYSTEM, WHICH BEGAN OPERATIONS IN APRIL, 1978, IS 75%. THE CLEANED GAS PASSES THROUGH AN IN-LINE STEAM REHEATER INTO AN ACID BRICK LINED STACK. THE OPEN WATER LOOP SYSTEM DEPOSITS ITS SLUDGE INTO A FLY ASH POND. |
| ARIZONA PUBLIC SERVICE<br>CHOLLA<br>4<br>NEW 350.0 MW (GROSS)<br>126.0 MW (ESC)<br>COAL<br>.50 %S<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 6/80 | CHOLLA 4 OF ARIZONA PUBLIC SERVICE IS PRESENTLY UNDER CONSTRUCTION IN JOSEPH CITY, ARIZONA. START UP IS SCHEDULED FOR JUNE, 1980. THE PULVERIZED COAL (0.5% S, 10,150 BTU/LB) FIRED BOILER WILL EXHAUST FLUE GAS THROUGH AN ESP TO A PACKED TOWER WHICH WILL TREAT 36% OF THE GAS WITH LIMESTONE. |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS<br>1<br>RETROFIT 175.0 MW (GROSS)<br>175.0 MW (ESC)<br>COAL<br>.75 %S SUBBITUMINOUS<br>LIME/ALKALINE FLYASH<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 11/79 | ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1, 2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUB-BITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979. |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS<br>2<br>RETROFIT 175.0 MW (GROSS)<br>175.0 MW (ESC)<br>COAL<br>.75 %S SUBBITUMINOUS<br>LIME/ALKALINE FLYASH<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 11/79 | ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUB-BITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS<br>3<br>RETROFIT 229.0 MW (GROSS)<br>229.0 MW (ESC)<br>COAL<br>.75 %S SUBBITUMINOUS<br>LIME/ALKALINE FLYASH<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 11/79 | ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8650 BTU/LB) UNIT 3 SUPPLIES 1,030,000 ACFM INTO 2 CHEMICO VENTURI SCRUBBERS FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979. |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS<br>4<br>RETROFIT 755.0 MW (GROSS)<br>755.0 MW (ESC)<br>COAL<br>.75 %S<br>LIME<br>UNITED ENGINEERS<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 0/82 | ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982. |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS<br>5<br>RETROFIT 755.0 MW (GROSS)<br>755.0 MW (ESC)<br>COAL<br>.75 %S<br>LIME<br>UNITED ENGINEERS<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 0/82 | ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982. |
| ASSOCIATED ELECTRIC COOP<br>THOMAS HILL<br>3<br>NEW 730.0 MW (GROSS)<br>670.0 MW (ESC)<br>COAL<br>4.80 %S<br>LIMESTONE<br>PULLMAN KELLOGG<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 1/82 | THOMAS HILL 3 OF ASSOCIATED ELECTRIC COOP IS A PULVERIZED COAL (4.8% S, 9,700 BTU/LB) FIRED UNIT LOCATED IN MOBERLY, MISSOURI. TWO COLD SIDE ESP'S WILL PRECEDE THE FOUR 91.5% EFFICIENT PULLMAN KELLOGG HORIZONTAL WEIR FGD MODULES USING MAGNESIUM-PROMOTED LIMESTONE AS THE ABSORBENT. THE CLEANED GAS WILL PASS THROUGH A VERTICAL CHEVRON MIST ELIMINATOR TO A 620 FOOT BRICK LINED STACK. REHEAT WILL BE ACCOMPLISHED BY BYPASS. DRY FIXATED SLUDGE WILL BE TRUCKED TO AN ACTIVE STRIP MINE. THE SYSTEM WILL USE A CLOSED WATER LOOP. THE FGD SYSTEM IS UNDER CONSTRUCTION AND START UP IS EXPECTED IN JANUARY, 1982. |
| BASIN ELECTRIC POWER COOP<br>ANTELOPE VALLEY<br>1<br>NEW 440.0 MW (GROSS)<br>440.0 MW (ESC)<br>COAL<br>.68 %S LIGNITE<br>LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER<br>ENERGY CONSUMPTION: .0%<br>STATUS 2 STARTUP 4/82 | UNIT 1 OF BASIN ELECTRIC POWER COOP'S ANTELOPE VALLEY PLANT IS PRESENTLY UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT WILL BURN PULVERIZED COAL (0.68% S, 6600 BTU/LB LIGNITE) AND SUPPLY 2,055,000 ACFM TO A DRY LIME FGD SYSTEM SUPPLIED BY WESTERN PRECIPITATION. THE 62% EFFICIENT SYSTEM WILL CONSIST OF 5 NIRO ATOMIZER SPRAY DRYERS AND TWO BAGHOUSES. THE CLEANED GAS, ALONG WITH A 4% BYPASS REHEAT, WILL EXIT A 600 FOOT PVC LINED STACK. THE SYSTEM WILL USE A CLOSED WATER LOOP AND THE DRY POWDER WILL BE USED FOR LANDFILL IN A COAL MINE. START UP IS EXPECTED IN APRIL, 1982. |
| BASIN ELECTRIC POWER COOP<br>ANTELOPE VALLEY<br>2<br>NEW 440.0 MW (GROSS)<br>440.0 MW (ESC)<br>COAL<br>.68 %S LIGNITE<br>LIME/SPRAY DRYING<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: .0%<br>STATUS 5 STARTUP 4/84 | ANTELOPE VALLEY 2 OF BASIN ELECTRIC POWER COOP WILL BE LOCATED IN BEULAH, NORTH DAKOTA. THE UTILITY IS PRESENTLY CONSIDERING VARIOUS FGD PROCESSES FOR THIS LIGNITE (0.68% S, 6600 BTU/LB) FIRED UNIT. THE UNIT WILL BE REQUIRED TO COMPLY WITH STATE EMISSIONS STANDARDS VIA BEST AVAILABLE CONTROL TECHNOLOGY. START UP IS SCHEDULED FOR APRIL, 1984. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| BASIN ELECTRIC POWER COOP<br>LARAMIE RIVER<br>1<br>NEW 570.0 MW (GROSS)<br>600.0 MW (ESC)<br>COAL<br>.81 %S SUBBITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: .0%<br>STATUS 2 STARTUP 4/80 | BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 1 IS PRESENTLY UNDER CONSTRUCTION IN WHEATLAND, WYOMING. THE PULVERIZED COAL (0.81% S, 8139 BTU/LB) FIRED BOILER WILL FEED 2,300,000 ACFM OF FLUE GAS THROUGH A COLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL EXIT FROM A VERTICAL CHEVRON DEMISTER INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE USED. THE FLYASH FIXATED SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM WILL EMPLOY A CLOSED WATER LOOP. START UP IS SCHEDULED FOR APRIL, 1980. |
| BASIN ELECTRIC POWER COOP<br>LARAMIE RIVER<br>2<br>NEW 570.0 MW (GROSS)<br>600.0 MW (ESC)<br>COAL<br>.81 %S SUBBITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: .0%<br>STATUS 2 STARTUP 11/80 | BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 2 IS PRESENTLY UNDER CONSTRUCTION IN WHEATLAND, WYOMING. THE PULVERIZED COAL (0.31% S, 8139 BTU/LB) FIRED BOILER WILL FEED 2,300,000 ACFM OF FLUE GAS THROUGH A OLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL EXIT FROM A VERTICAL CHEVRON DEMISTER INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE USED. THE FLYASH FIXATED SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM WILL EMPLOY A CLOSED WATER LOOP. START UP IS SCHEDULED FOR NOVEMBER, 1980. |
| BASIN ELECTRIC POWER COOP<br>LARAMIE RIVER<br>3<br>NEW 570.0 MW (GROSS)<br>600.0 MW (ESC)<br>COAL<br>.54 %S SUBBITUMINOUS<br>LIME/SPRAY DRYING<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: .0%<br>STATUS 2 STARTUP 4/82 | LARAMIE RIVER 3 OF BASIN ELECTRIC POWER COOP IS UNDER CONSTRUCTION IN WHEATLAND, WYOMING, AND WILL UTILIZE FOUR DRY LIME INJECTION MODULES, AND A COLD SIDE ESP. THE BOILER WILL FIRE PULVERIZED COAL (0.54% S, 8100 BTU/LB) AND WILL SUPPLY 2,800,000 ACFM OF FLUE GAS TO THE FGD SYSTEM, WHICH WILL REMOVE 85% OF THE SO2 BEFORE THE GAS EXITS THROUGH A 600 FOOT ACID BRICK LINED STACK. A 3% BYPASS WILL BE USED FOR REHEAT. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND WILL LANDFILL THE DRY POWDER WASTE. OPERATIONS ARE SCHEDULED TO COMMENCED IN APRIL, 1982. |
| BIG RIVERS ELECTRIC<br>D. B. WILSON<br>1<br>NEW 440.0 MW (GROSS)<br>440.0 MW (ESC)<br>COAL<br>***** %S BITUMINOUS<br>LIME<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/84 | BIG RIVERS ELECTRIC HAS PLANS FOR TWO NEW UNITS, D.B. WILSON 1 AND 2. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 440 EACH. THE UNITS WILL UTILIZE EITHER A LIME, LIMESTONE OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 1 IS EXPECTED IN 1984. |
| BIG RIVERS ELECTRIC<br>D. B. WILSON<br>2<br>NEW 440.0 MW (GROSS)<br>440.0 MW (ESC)<br>COAL<br>***** %S BITUMINOUS<br>LIME<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/85 | BIG RIVERS ELECTRIC HAS PLANS FOR TWO NEW UNITS, D.B. WILSON 1 AND 2. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 440 EACH. THE UNITS WILL UTILIZE EITHER A LIME, LIMESTONE OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 2 IS EXPECTED IN 1985. |
| BIG RIVERS ELECTRIC<br>GREEN<br>1<br>NEW 242.0 MW (GROSS)<br>242.0 MW (ESC)<br>COAL<br>3.75 %S BITUMINOUS<br>LIME<br>AMERICAN AIR FILTER<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 12/79 | UNIT 1 OF BIG RIVERS ELECTRIC'S GREEN STATION IS LOCATED IN SEBREE,KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER SUPPLIES 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND EXITS A SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM IS POZ-O-TEC STABILIZED. OPERATIONS COMMENCED IN DECEMBER 1979. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| BIG RIVERS ELECTRIC<br>GREEN<br>2<br>NEW 242.0 MW (GROSS)<br>242.0 MW (ESC)<br>COAL<br>3.75 %S BITUMINOUS<br>LIME<br>AMERICAN AIR FILTER<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 11/80 | UNIT 2 OF BIG RIVERS ELECTRIC'S GREEN STATION IS BEING CONSTRUCTED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER WILL SUPPLY 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR AND WILL EXIT A SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED. START UP IS SCHEDULED FOR NOVEMBER, 1980. |
| CENTRAL ILLINOIS LIGHT<br>DUCK CREEK<br>1<br>NEW 416.0 MW (GROSS)<br>378.0 MW (ESC)<br>COAL<br>3.30 %S BITUMINOUS<br>LIMESTONE<br>RILEY STOKER/ENVIRONEERING<br>ENERGY CONSUMPTION: 2.9%<br>STATUS 1 STARTUP 7/76 | DUCK CREEK 1 OF CENTRAL ILLINOIS LIGHT IS LOCATED IN CANTON, ILLINOIS. THE BALANCED DRAFT, FRONT FIRED, DRY BOTTOM UNIT BURNS PULVERIZED BITUMINOUS COAL (3.3% S, 10,500 BTU/LB) AND SUPPLIES 2,415,000 ACFM OF FLUE GAS TO TWO COLD SIDE ESP'S FOLLOWED BY FOUR RILEY STOKER/ENVIRONEERING ROD DECK SPRAY TOWER MODULES. THE FGD SYSTEM HAS BEEN OPERATIONAL (ONE MODULE) SINCE JULY, 1976, AND IS DESIGNED TO REMOVE 85% OF THE SO2. HORIZONTAL CHEVRON MIST ELIMINATORS FOLLOW THE ABSORBERS, AND THE CLEANED GAS EXITS TO A 500 FOOT CEILCOTE LINED STACK WITHOUT REHEAT. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SLUDGE IS DISPOSED OF IN AN ON SITE CLAY LINED POND. |
| CENTRAL ILLINOIS LIGHT<br>DUCK CREEK<br>2<br>NEW 450.0 MW (GROSS)<br>416.0 MW (ESC)<br>COAL<br>3.30 %S BITUMINOUS<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 1/86 | CENTRAL ILLINOIS LIGHT IS CURRENTLY EVALUATING BIDS ON A LIMESTONE OR DUAL ALKALI FGD SYSTEM FOR UNIT 2 OF ITS DUCK CREEK STATION. THE BITUMINOUS COAL FIRED BOILER WILL FEED ITS FLUE GAS THROUGH A COLD SIDE ESP. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP AND IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1986. |
| CENTRAL ILLINOIS PUBLIC SERV<br>NEWTON<br>1<br>NEW 617.0 MW (GROSS)<br>617.0 MW (ESC)<br>COAL<br>2.25 %S BITUMINOUS<br>DUAL ALKALI<br>BUELL/ENVIROTECH<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 9/79 | NEWTON 1 OF CENTRAL ILLINOIS PUBLIC SERVICE IS A TANGENTIALLY FIRED, DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4% S, 10,900 BTU/LB) FIRED UNIT LOCATED IN NEWTON, ILLINOIS. A COLD SIDE ESP RECEIVES 2,163,480 ACFM OF FLUE GAS AND FEEDS IT TO FOUR BUELL ENVIROTECH POLYSPHERE PACKED TRAY TOWERS FOLLOWED BY TWO VERTICAL MIST ELIMINATORS PER MODULE. THE CLEANED GAS IS BOOSTED 25 DEG F BY A COMBINATION OF TWO DIFFERENT TYPES OF IN-LINE REHEATERS PLUS BYPASS REHEAT, AND THEN EXITS A 530 FOOT PRECRETE LINED STACK. THE WATER LOOP IS CLOSED, AND THE SLUDGE IS POZ-O-TEC TREATED. |
| CENTRAL MAINE POWER<br>SEARS ISLAND<br>1<br>NEW 600.0 MW (GROSS)<br>600.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 1/89 | SEARS ISLAND 1 IS A PLANNED UNIT TO BE BUILT ON PENOBSCOT BAY BY CENTRAL MAINE POWER. BECAUSE OF THE DISCOVERY OF A GEOLOGICAL FAULT ON SEARS ISLAND, PLANS FOR A 1150 MW NUCLEAR POWER PLANT HAVE BEEN REPLACED WITH PLANS FOR A 600 MW COAL FIRED PLANT. LIME AND LIMESTONE SCRUBBING ARE THE PRIMARY METHODS BEING CONSIDERED FOR COMPLIANCE WITH THE NSPS. IT WILL BE TWO YEARS BEFORE ALL PERMITS REQUIRED HAVE BEEN RECEIVED. START UP IS SCHEDULED FOR JANUARY, 1989. |
| CINCINNATI GAS & ELECTRIC<br>EAST BEND<br>1<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 2.9%<br>STATUS 6 STARTUP 0/ 0 | CINCINNATI GAS AND ELECTRIC HAS PLANS FOR A NEW UNIT, EAST BEND 1, TO BE LOCATED ADJACENT TO EAST BENT 2 AT THE RABBITHASH, KENTUCKY SITE. THE COAL FIRED BOILER WILL HAVE A GENERATING CAPACITY OF 650MW. THE UNIT'S EXPECTED START UP HAS NOT BEEN DETERMINED. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| CINCINNATI GAS & ELECTRIC<br>EAST BEND<br>2<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>5.00 %S<br>LIME<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: 2.9%<br>STATUS 2 STARTUP 9/80 | EAST BEND 2 OF CINCINNATI GAS AND ELECTRIC IS A PULVERIZED COAL (5% S) FIRED BOILER UNDER CONSTRUCTION IN RABBITHASH, KENTUCKY. THE EMISSION CONTROL SYSTEM CONSISTS OF A HOT SIDE ESP FOLLOWED BY THREE BABCOCK AND WILCOX LIME FGD MODULES. THE 87% CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR BEFORE BEING WARMED BY AN INDIRECT HOT AIR REHEATER AND EXITING THROUGH A BRICK LINED 650 FOOT STACK. THE SLUDGE FROM THIS CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED BEFORE DISPOSAL IN AN ON SITE LANDFILL. START UP IS EXPECTED IN SEPTEMBER, 1980. |
| COLORADO UTE ELECTRIC ASSN.<br>CRAIG<br>1<br>NEW 447.0 MW (GROSS)<br>447.0 MW (ESC)<br>COAL<br>.45 %S SUBBITUMINOUS<br>LIMESTONE<br>PEABODY PROCESS SYSTEMS<br>ENERGY CONSUMPTION: 5.4%<br>STATUS 2 STARTUP 4/80 | THE COLORADO UTE ELECTRIC ASSN IS PRESENTLY CONSTRUCTING TWO IDENTICAL UNITS IN CRAIG, COLORADO, CRAIG 1 AND 2. BOTH UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). EACH UNIT'S HOT SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS WILL REMOVE 85% OF THE SO2. THE SCRUBBER EXHAUST WILL BE WARMED BY AN IN-LINE STEAM COIL REHEATER AND WILL PASS THROUGH A 600 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE STABILIZED SLUDGE WILL BE DISPOSED OF IN AN OFF SITE MINEFILL. UNIT 1 START UP IS EXPECTED IN APRIL, 1980. |
| COLORADO UTE ELECTRIC ASSN.<br>CRAIG<br>2<br>NEW 447.0 MW (GROSS)<br>447.0 MW (ESC)<br>COAL<br>.45 %S SUBBITUMINOUS<br>LIMESTONE<br>PEABODY PROCESS SYSTEMS<br>ENERGY CONSUMPTION: 5.4%<br>STATUS 1 STARTUP 8/79 | THE CRAIG 2 UNIT OF THE COLORADO UTE ELECTRIC ASSN IS LOCATED IN CRAIG, COLORADO. THE CRAIG 2 UNIT FIRES PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). THE UNIT'S HOT SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS WILL REMOVE 85% OF THE SO2. THE SCRUBBER EXHAUST IS WARMED BY AN IN-LINE STEAM COIL REHEATER AND PASSES THROUGH A 600 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE STABILIZED SLUDGE IS DISPOSED OF IN AN OFF SITE MINEFILL. START UP OF UNIT 2 WAS IN AUGUST, 1979. |
| COLORADO UTE ELECTRIC ASSN.<br>CRAIG<br>3<br>NEW 447.0 MW (GROSS)<br>447.0 MW (ESC)<br>COAL<br>.45 %S SUBBITUMINOUS<br>LIME/SPRAY DRYING<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/82 | COLORADO UTE ELECTRIC ASSN. HAS PLANS FOR A NEW UNIT, CRAIG 3, TO BE LOCATED IN CRAIG, COLORADO ALONG WITH UNITS 1 AND 2. THE UNIT WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). THE SYSTEM WILL UTILIZE A DRY SCRUBBER WITH LIMESTONE INJECTION FOR EMISSION CONTROL. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN 1982. |
| COLUMBUS & SOUTHERN OHIO ELEC.<br>CONESVILLE<br>5<br>NEW 411.0 MW (GROSS)<br>411.0 MW (ESC)<br>COAL<br>4.67 %S BITUMINOUS<br>LIME<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: 3.9%<br>STATUS 1 STARTUP 1/77 | CONESVILLE 5 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECEIVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO2 REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JANUARY, 1977, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. |
| COLUMBUS & SOUTHERN OHIO ELEC.<br>CONESVILLE<br>6<br>NEW 411.0 MW (GROSS)<br>411.0 MW (ESC)<br>COAL<br>4.67 %S BITUMINOUS<br>LIME<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: 3.9%<br>STATUS 1 STARTUP 6/78 | CONESVILLE 6 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECEIVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO2 REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JUNE, 1978, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. |

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| UNIT IDENTIFICATION | ABSTRACT |
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| COLUMBUS & SOUTHERN OHIO ELEC.<br>POSTON<br>5<br>NEW 425.0 MW (GROSS)<br>375.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 4.7%<br>STATUS 6 STARTUP 8/86 | COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 5 IS EXPECTED IN 1986. |
| COLUMBUS & SOUTHERN OHIO ELEC.<br>POSTON<br>6<br>NEW 425.0 MW (GROSS)<br>375.0 MW (ESC)<br>COAL<br>2.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 4.7%<br>STATUS 6 STARTUP 0/89 | COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 6 IS EXPECTED IN 1989. |
| COMMONWEALTH EDISON<br>POWERTON<br>51<br>RETROFIT 450.0 MW (GROSS)<br>450.0 MW (ESC)<br>COAL<br>3.53 %S<br>LIMESTONE<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: 5.6%<br>STATUS 2 STARTUP 4/80 | COMMONWEALTH EDISON IS PRESENTLY RETROFITTING BOILER NUMBER 51 AT ITS POWERTON STATION WITH A UOP LIMESTONE FGD SYSTEM. UNIT 51 IS ONE OF TWO IDENTICAL BOILERS SUPPLYING STEAM TO AN 850 MW TURBINE. THE PULVERIZED COAL (3.6% S, 10,500 BTU/LB) FIRED BOILER FEEDS FLUE GAS THROUGH AN ESP TO 3 TCA MODULES WHICH ARE DESIGNED TO REMOVE 74% OF THE SO2. A STEAM INDIRECT HOT AIR REHEATER WILL BOOST THE TEMPERATURE BEFORE THE GAS EXITS AN ACID BRICK LINED STACK. THE SYSTEM WILL UTILIZE A CLOSED WATER LOOP, AND THE SLUDGE WILL BE POZ-O-TEC STABILIZED AND DISPOSED OF IN A LANDFILL. THE FGD SYSTEM IS UNDER CONSTRUCTION, AND THE START UP IS EXPECTED IN APRIL, 1980. |
| COOPERATIVE POWER ASSOCIATION<br>COAL CREEK<br>1<br>NEW 545.0 MW (GROSS)<br>327.0 MW (ESC)<br>COAL<br>.63 %S LIGNITE<br>LIME/ALKALINE FLYASH<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 8/79 | COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT WILL BE PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE WILL BE DISPOSED IN A CLAY LINED POND. UNIT 1 OPERATIONS BEGAN IN AUGUST 1979. |
| COOPERATIVE POWER ASSOCIATION<br>COAL CREEK<br>2<br>NEW 545.0 MW (GROSS)<br>327.0 MW (ESC)<br>COAL<br>.63 %S LIGNITE<br>LIME/ALKALINE FLYASH<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 7/80 | COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT WILL BE PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE WILL BE DISPOSED OF IN A CLAY LINED POND. UNIT 2 IS PRESENTLY UNDER CONSTRUCTION AND SHOULD INITIALLY START OPERATIONS IN JULY, 1980. |
| DELMARVA POWER & LIGHT<br>DELAWARE CITY<br>1-3<br>RETROFIT 180.0 MW (GROSS)<br>180.0 MW (ESC)<br>COKE<br>7.00 %S FLUID PETROLEUM COKE<br>WELLMAN LORD<br>DAVY MCKEE<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 4/80 | DELMARVA POWER & LIGHT'S DELAWARE CITY PLANT HAS FOUR BOILERS, THREE OF WHICH HAVE STEAM CAPACITIES OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. LOW SULFUR CRUDE OIL WILL BE REPLACED WITH COKE (7-8% S) IN THE BOILER WHEN THE FGD SYSTEM IS COMPLETE, IN APRIL, 1980. A VENTURI PARTICULATE SCRUBBER AND A WELLMAN-LORD FGD SYSTEM (90% DESIGN EFFICIENCY) SUPPLIED BY DAVY POWERGAS ARE PRESENTLY UNDER CONSTRUCTION. AN INDIRECT GAS REHEATER WILL BE USED. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| DELMARVA POWER & LIGHT<br>VIENNA<br>9<br>NEW 550.0 MW (GROSS)<br>550.0 MW (ESC)<br>COAL<br>2.70 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 6/87 | DELMARVA POWER AND LIGHT IS PLANNING A NEW UNIT, VIENNA 9, TO BE CONSTRUCTED IN VIENNA, MARYLAND. THE UTILITY IS PRESENTLY CONSIDERING A LIMESTONE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNIT IS EXPECTED TO COMMENCE OPERATIONS IN JUNE 1987. |
| DESERET GENERATION & TRANS COO<br>MOON LAKE<br>1<br>NEW 410.0 MW (GROSS)<br>410.0 MW (ESC)<br>COAL<br>.50 %S BITUMINOUS<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 12/84 | MOON LAKE 1 IS A PULVERIZED COAL (0.5% S, 10,500 BTU/LB) FIRED UNIT PLANNED BY DESERET GENERATION AND TRANSMISSION COOP. TO BE LOCATED IN VERNAL, UTAH. THE UTILITY IS PRESENTLY REQUESTING BIDS FOR A WET LIMESTONE SCRUBBING SYSTEM HAVING A SO2 REMOVAL EFFICIENCY OF 95%. THE SYSTEM WILL FEATURE A BAGHOUSE DESIGNED TO REMOVE 99.6% OF THE PARTICULATE. THE UNIT WILL OPERATE IN A CLOSED WATER LOOP WITH SLUDGE DISPOSAL ON SITE IN A LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1984. |
| DESERET GENERATION & TRANS COO<br>MOON LAKE<br>2<br>NEW 410.0 MW (GROSS)<br>410.0 MW (ESC)<br>COAL<br>.50 %S BITUMINOUS<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 0/88 | MOON LAKE 2 IS A PULVERIZED COAL (0.5% S, 10,500 BTU/LB) FIRED UNIT PLANNED BY DESERET GENERATION AND TRANSMISSION COOP. TO BE LOCATED IN VERNAL, UTAH. THE UTILITY IS PRESENTLY REQUESTING BIDS FOR A WET LIMESTONE SCRUBBING SYSTEM HAVING A SO2 REMOVAL EFFICIENCY OF 95%. THE SYSTEM WILL FEATURE A BAGHOUSE DESIGNED TO REMOVE 99.6% OF THE PARTICULATE. THE UNIT WILL OPERATE IN A CLOSED WATER LOOP WITH SLUDGE DISPOSAL ON SITE IN A LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1988. |
| DUQUESNE LIGHT<br>ELRAMA<br>1-4<br>RETROFIT 510.0 MW (GROSS)<br>510.0 MW (ESC)<br>COAL<br>2.20 %S<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: 3.5%<br>STATUS 1 STARTUP 1[illegible]75 | ELRAMA 1-4 OF DUQUESNE LIGHT CONSISTS OF FOUR PULVERIZED COAL (2.2% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN ELRAMA, PENNSYLVANIA. THE EMISSION CONTROL SYSTEM ON THIS SITE CONSISTS OF AN ESP FOLLOWED BY A MECHANICAL COLLECTOR AND FIVE VARIABLE THROAT VENTURI LIME ABSORBER MODULES SUPPLIED BY CHEMICO, WHICH ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. THE CLEANED GAS PASSES THROUGH A DIRECT OIL FIRED REHEATER BEFORE EXITING A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS HAULED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE OCTOBER, 1975. |
| DUQUESNE LIGHT<br>PHILLIPS<br>1-6<br>RETROFIT 408.0 MW (GROSS)<br>410.0 MW (ESC)<br>COAL<br>1.92 %S BITUMINOUS<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: 3.4%<br>STATUS 1 STARTUP 7/73 | THE PHILLIPS POWER STATION OF DUQUESNE LIGHT CONSISTS OF SIX DRY BOTTOM PULVERIZED COAL (2.2% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN SOUTH HEIGHT, PENNSYLVANIA. PARTICULATE CONTROL IS ACCOMPLISHED BY SIX ESP/MECHANICAL COLLECTOR COMBINATIONS (ONE/BOILER). ONE TWO STAGE AND THREE SINGLE STAGE VARIABLE THROAT VENTURI LIME FGD MODULES SUPPLIED BY CHEMICO ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT OIL FIRED REHEATER WHICH RAISES THE GAS TEMPERATURE BY 20 DEG F BEFORE IT LEAVES VIA A 340 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS TRUCKED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JULY, 1973. |
| EAST KENTUCKY POWER COOP<br>J. K. SMITH<br>1<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 1/85 | THE EAST KENTUCKY POWER COOP HAS PLANS TO FIRE TWO NEW UNITS. THE J.K. SMITH 1 AND 2 WILL UTILIZE EITHER A DRY PROCESS OR A WET LIME PROCESS FOR EMISSION CONTROL. UNIT 1 IS EXPECTED TO START UP IN JANUARY, 1985. |

| UNIT IDENTIFICATION | ABSTRACT |
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| EAST KENTUCKY POWER COOP<br>J. K. SMITH<br>2<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 1/87 | THE EAST KENTUCKY POWER COOP HAS PLANS TO FIRE TWO NEW UNITS. THE J.K. SMITH 1 AND 2 WILL UTILIZE EITHER A DRY PROCESS OR A WET LIME PROCESS FOR EMISSION CONTROL. UNIT 2 IS EXPECTED TO START UP IN JANUARY, 1987. |
| EAST KENTUCKY POWER COOP<br>SPURLOCK<br>2<br>NEW 500.0 MW (GROSS)<br>500.0 MW (ESC)<br>COAL<br>3.50 %S<br>LIME<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 1/81 | SPURLOCK 2 OF EAST KENTUCKY POWER COOPERATIVE IS A BALANCED DRAFT PULVERIZED COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN MAYSVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP FOLLOWED BY AN ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME FGD SYSTEM (90% DESIGN SO2 REMOVAL EFFICIENCY). FLUE GAS FROM UNIT ONE WILL BE USED TO REHEAT THE CLEANED GAS. THE SYSTEM, SLATED FOR START UP IN JANUARY, 1981, WILL EMPLOY A CLOSED WATER LOOP AND POZ-O-TEC SLUDGE STABILIZATION. |
| GENERAL PUBLIC UTILITIES<br>COHO<br>1<br>NEW 690.0 MW (GROSS)<br>800.0 MW (ESC)<br>COAL<br>3.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 9.4%<br>STATUS 6 STARTUP 12/88 | COHO 1 IS A 3.5% S COAL FIRED UNIT PLANNED BY GENERAL PUBLIC UTILITIES TO BE LOCATED IN ERIE, PENNSYLVANIA. PRIMARY CONSIDERATION IS BEING GIVEN TO LIME AND LIMESTONE NON-SLURRY TYPE FGD SYSTEMS. THE UNIT AND FGD SYSTEM ARE SCHEDULED TO START UP IN DECEMBER, 1988. |
| GENERAL PUBLIC UTILITIES<br>GILBERT<br>1<br>NEW 625.0 MW (GROSS)<br>625.0 MW (ESC)<br>COAL<br>3.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/90 | GENERAL PUBLIC UTILITIES HAS PLANS FOR A NEW UNIT, GILBERT 9, TO BE LOCATED IN MILFORD, NEW JERSEY. THE UTILITY IS CONSIDERING FGD AS AN EMISSION CONTROL STRATEGY. THE EXPECTED START UP DATE IS IN 1990. |
| GENERAL PUBLIC UTILITIES<br>SCOTTSVILLE<br>1<br>NEW 625.0 MW (GROSS)<br>625.0 MW (ESC)<br>COAL<br>3.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/91 | GENERAL PUBLIC UTILITIES IS PLANNING A NEW UNIT TO BE LOCATED IN SCOTTSVILLE, PENNSYLVANIA. THE SCOTTSVILLE 1 UNIT IS EXPECTED TO START UP IN 1991. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS A EMISSION CONTROL STRATEGY. |
| GENERAL PUBLIC UTILITIES<br>SEWARD<br>7<br>NEW 690.0 MW (GROSS)<br>800.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 9.4%<br>STATUS 6 STARTUP 5/87 | GENERAL PUBLIC UTILITIES IS PLANNING A NEW UNIT, SEWARD 7, TO BE BUILT IN SEWARD, PENNSYLVANIA. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY, WITH NON-SLURRY TYPE LIME AND LIMESTONE SYSTEMS LOOKING THE MOST PROMISING. START UP IS EXPECTED IN MAY, 1987. |

| UNIT IDENTIFICATION | ABSTRACT |
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| GENERAL PUBLIC UTILITIES<br>WEHRUM<br>1<br>NEW 625.0 MW (GROSS)<br>625.0 MW (ESC)<br>COAL<br>3.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/95 | THE WEHRUM 1 UNIT PLANNED BY GENERAL PUBLIC UTILITIES IS TO BE LOCATED IN WEHRUM, PENNSYLVANIA. THE UTILITY IS PRESENTLY CONSIDERING FGD AS AN EMISSION CONTROL STRATEGY. THE UNIT IS EXPECTED TO COMMENCE OPERATIONS IN 1995. |
| GRAND HAVEN BRD OF LIGHT & PWR<br>J. B. SIMS<br>3<br>NEW 81.0 MW (GROSS)<br>81.0 MW (ESC)<br>COAL<br>2.75 %S BITUMINOUS<br>LIME<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 6/83 | THE GRAND HAVEN BOARD OF LIGHT AND POWER'S J.B. SIMS 3 IS A PLANNED BITUMINOUS COAL (2.75% S, 11,000 BTU/LB) FIRED UNIT TO BE LOCATED IN GRAND HAVEN, MICHIGAN. A CONTRACT HAS BEEN AWARDED TO BABCOCK AND WILCOX TO SUPPLY TWO SPRAY TOWERS TO CONTROL EMISSIONS. EACH SCRUBBER SYSTEM WILL UTILIZE A CHEVRON MIST ELIMINATOR AND AN IN-LINE REHEATER. THE SLUDGE IS TO BE DISPOSED IN AN OFF SITE LANDFILL. OPERATIONS ARE TO COMMENCE IN JUNE, 1983. |
| HOOSIER ENERGY<br>MEROM<br>1<br>NEW 490.0 MW (GROSS)<br>441.0 MW (ESC)<br>COAL<br>3.50 %S<br>LIMESTONE<br>MITSUBISHI HEAVY INDUSTRIES<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 5/82 | MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WITH PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 1 IS SCHEDULED FOR MAY, 1982. |
| HOOSIER ENERGY<br>MEROM<br>2<br>NEW 490.0 MW (GROSS)<br>441.0 MW (ESC)<br>COAL<br>3.50 %S<br>LIMESTONE<br>MITSUBISHI HEAVY INDUSTRIES<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 7/81 | MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WITH PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 2 IS SCHEDULED FOR JULY, 1981. |
| HOUSTON LIGHTING & POWER CO.<br>W.A. PARISH<br>8<br>NEW 600.0 MW (GROSS)<br>492.0 MW (ESC)<br>COAL<br>.60 %S SUBBITUMINOUS<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 11/82 | W.A. PARISH 8 IS A PULVERIZED COAL (0.6% S, 8700 BTU/LB) FIRED UNIT PLANNED BY HOUSTON LIGHTING AND POWER CO TO BE LOCATED IN THOMPSONS, TEXAS. THE UTILITY HAS AWARDED A CONTRACT TO CHEMICO FOR A LIMESTONE FGD SYSTEM WHICH WILL REMOVE 82% OF THE FLUE GAS SO2. REHEAT WILL BE PROVIDED BY BYPASSING 18% OF THE PARTICULATE CLEANED FLUE GAS. SLUDGE WILL BE DEWATERED, BLENDED WITH FLYASH, AND DISPOSED IN AN ON SITE LANDFILL. START UP IS EXPECTED IN NOVEMBER, 1982. |
| INDIANAPOLIS POWER & LIGHT<br>PATRIOT<br>1<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>3.50 %S<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/87 | INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL. |

| UNIT IDENTIFICATION | ABSTRACT |
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| INDIANAPOLIS POWER & LIGHT<br>PATRIOT<br>2<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>3.50 %S<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/87 | INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL. |
| INDIANAPOLIS POWER & LIGHT<br>PATRIOT<br>3<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>3.50 %S<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/87 | INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL. |
| INDIANAPOLIS POWER & LIGHT<br>PETERSBURG<br>3<br>NEW 532.0 MW (GROSS)<br>532.0 MW (ESC)<br>COAL<br>3.25 %S BITUMINOUS<br>LIMESTONE<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: 2.4%<br>STATUS 1 STARTUP 12/77 | PETERSBURG 3 OF INDIANAPOLIS POWER AND LIGHT IS LOCATED IN PETERSBURG, INDIANA, AND BURNS 4.5% S BITUMINOUS COAL (11,000 BTU/LB). TWO COLD SIDE ESP'S ARE LOCATED UPSTREAM OF 4 85% EFFICIENT UOP LIMESTONE TCA MODULES. A HORIZONTAL MIST ELIMINATOR PRECEDES AN INDIRECT HOT AIR REHEATER THAT BOOSTS THE GAS TEMPERATURE BY 30 DEG F BEFORE IT EXITS THE 616 FOOT RIGIFLAKE 4850 LINED STACK. STABILIZED SLUDGE IS DISPOSED IN AN ON SITE POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. THIS UNIT HAS BEEN OPERATIONAL SINCE DECEMBER, 1977. |
| INDIANAPOLIS POWER & LIGHT<br>PETERSBURG<br>4<br>NEW 530.0 MW (GROSS)<br>530.0 MW (ESC)<br>COAL<br>3.50 %S BITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 2.1%<br>STATUS 2 STARTUP 10/84 | PETERSBURG 4 OF INDIANAPOLIS POWER AND LIGHT IS A BITUMINOUS COAL (3.50% S 11,000 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN PETERSBURG, INDIANA. THE LIMESTONE FGD SYSTEM FOR THIS UNIT WILL BE SUPPLIED BY RESEARCH COTTRELL. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND SLUDGE WILL BE POZ-O-TEC STABILIZED BEFORE PONDING. START UP IS SLATED FOR OCTOBER OF 1984. |
| KANSAS CITY POWER & LIGHT<br>HAWTHORN<br>3<br>RETROFIT 90.0 MW (GROSS)<br>90.0 MW (ESC)<br>COAL<br>.60 %S BITUMINOUS<br>LIME<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 2.2%<br>STATUS 1 STARTUP 11/72 | HAWTHORN 3 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6% S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY, 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. |
| KANSAS CITY POWER & LIGHT<br>HAWTHORN<br>4<br>RETROFIT 90.0 MW (GROSS)<br>90.0 MW (ESC)<br>COAL<br>.60 %S BITUMINOUS<br>LIME<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 2.2%<br>STATUS 1 STARTUP 8/72 | HAWTHORN 4 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6% S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY, 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| KANSAS CITY POWER & LIGHT<br>LA CYGNE<br>1<br>NEW 874.0 MW (GROSS)<br>874.0 MW (ESC)<br>COAL<br>5.39 %S SUBBITUMINOUS<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: 2.7%<br>STATUS 1 STARTUP 2/73 | LA CYGNE 1 IS A WET BOTTOM, CYCLONE FIRED PULVERIZED SUBBITUMINOUS COAL (5.39% S, 9421 BTU/LB) FIRED UNIT OF KANSAS CITY POWER AND LIGHT, LOCATED IN LA CYGNE, KANSAS. THE EMISSION CONTROL SYSTEM CONSISTS OF EIGHT VARIABLE THROAT VENTURI/LIMESTONE SIEVE TRAY TOWER TRAINS SUPPLIED BY BABCOCK AND WILCOX. EACH 80% (SO2 REMOVAL, DESIGN) EFFICIENT TRAIN IS FOLLOWED BY A COMBINATION SIEVE TRAY AND CHEVRON MIST ELIMINATOR, FOLLOWED BY AN INDIRECT REHEATER. THE CLEANED GAS EXITS THROUGH A 700 FOOT STEEL LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SCRUBBER SLUDGE IS DISPOSED IN AN UNLINED POND. INITIAL OPERATIONS OF THE FGD SYSTEM BEGAN IN FEBRUARY, 1973. |
| KANSAS POWER & LIGHT<br>JEFFREY<br>1<br>NEW 720.0 MW (GROSS)<br>540.0 MW (ESC)<br>COAL<br>.32 %S<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 8/78 | KANSAS CITY POWER AND LIGHT'S JEFFREY 1 IS A TANGENTIAL FIRED PULVERIZED COAL (0.32% S, 8125 BTU/LB) UNIT IN WAMEGO, KANSAS. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY SIX (ONE SPARE) LIMESTONE SPRAY TOWER MODULES SUPPLIED BY COMBUSTION ENGINEERING. THE DESIGN SO2 REMOVAL EFFICIENCY IS 50% (INCLUDING A 30% BYPASS REHEAT). THE UNIT HAS BEEN OPERATIONAL SINCE AUGUST, 1978. |
| KANSAS POWER & LIGHT<br>JEFFREY<br>2<br>NEW 700.0 MW (GROSS)<br>490.0 MW (ESC)<br>COAL<br>.30 %S<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 4/80 | UNIT 2, PRESENTLY UNDER CONSTRUCTION AT KANSAS POWER AND LIGHT'S JEFFREY ENERGY CENTER IN JEFFREY, KANSAS, WILL BURN 0.3% S PULVERIZED COAL (8100 BTU/LB). THIS UNIT'S EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP AND COMBUSTION ENGINEERING LIMESTONE SPRAY TOWERS. A 30% FLUE GAS BYPASS WILL PROVIDE REHEAT OF THE CLEANED GAS BEFORE IT EXITS THROUGH A 600 FOOT STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE, AND THE SLUDGE WILL BE STABILIZED WITH BOTTOM ASH AND PIPED TO AN ON-SITE CLAY LINED POND. SCHEDULED START UP OF THE SYSTEM IS APRIL, 1980. |
| KANSAS POWER & LIGHT<br>LAWRENCE<br>4<br>RETROFIT 125.0 MW (GROSS)<br>125.0 MW (ESC)<br>COAL<br>.55 %S<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 1/76 | LAWRENCE 4 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN JANUARY, 1977. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO2 REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. |
| KANSAS POWER & LIGHT<br>LAWRENCE<br>5<br>RETROFIT 420.0 MW (GROSS)<br>420.0 MW (ESC)<br>COAL<br>.55 %S<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 11/71 | LAWRENCE 5 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN APRIL, 1976. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO2 REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. |
| KENTUCKY UTILITIES<br>GREEN RIVER<br>1-3<br>RETROFIT 64.0 MW (GROSS)<br>64.0 MW (ESC)<br>COAL<br>4.00 %S BITUMINOUS<br>LIME<br>AMERICAN AIR FILTER<br>ENERGY CONSUMPTION: 3.1%<br>STATUS 1 STARTUP 9/75 | GREEN RIVER 1-3 OF KENTUCKY UTILITIES ARE THREE DRY BOTTOM PULVERIZED BITUMINOUS COAL (4% S, 11,000 BTU/LB) FIRED UNITS LOCATED IN CENTRAL CITY, KENTUCKY. EACH BOILER SUPPLIES 360,000 ACFM OF FLUE GAS TO A VARIABLE THROAT VENTURI FOLLOWED BY AN AMERICAN AIR FILTER LIME MOBILE BED CONTACTOR (80% DESIGN SO2 REMOVAL EFFICIENCY). A RADIAL VANE MIST ELIMINATOR IS FOLLOWED BY A STEAM TUBE REHEATER AND A 165 FOOT STACK. SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP. THE SYSTEM HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1975. |

| UNIT IDENTIFICATION | ABSTRACT |
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| LAKELAND UTILITIES<br>MCINTOSH<br>3<br>NEW 364.0 MW (GROSS)<br>364.0 MW (ESC)<br>COAL<br>2.56 %S BITUMINOUS<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 10/81 | MCINTOSH 3 OF LAKELAND UTILITIES IS BEING CONSTRUCTED IN LAKELAND, FLORIDA. BABCOCK AND WILCOX HAS BEEN AWARDED A CONTRACT TO SUPPLY AN 85% EFFICIENT (SO2) LIMESTONE FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY TWO PARALLEL FGD MODULES AND A 250 FOOT ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS A CONSTRUCTION BASE. CONSTRUCTION BEGAN IN NOVEMBER, 1979 AND START UP IS SCHEDULED TO BE IN OCTOBER, 1981. |
| LOUISVILLE GAS & ELECTRIC<br>CANE RUN<br>4<br>RETROFIT 188.0 MW (GROSS)<br>188.0 MW (ESC)<br>COAL<br>3.75 %S BITUMINOUS<br>LIME<br>AMERICAN AIR FILTER<br>ENERGY CONSUMPTION: 1.6%<br>STATUS 1 STARTUP 8/76 | UNIT 4 AT LOUISVILLE GAS AND ELECTRIC'S CANE RUN STATION IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. AN ESP AND TWO AMERICAN AIR FILTER CARBIDE LIME MOBILE BED ABSORBER MODULES (85% DESIGN SO2 REMOVAL) TREAT 734,000 ACFM OF FLUE GAS FROM THE BOILER. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT COMBUSTION REHEATER AND A 250 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THIS RETROFIT SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST, 1976. |
| LOUISVILLE GAS & ELECTRIC<br>CANE RUN<br>5<br>RETROFIT 200.0 MW (GROSS)<br>200.0 MW (ESC)<br>COAL<br>3.75 %S BITUMINOUS<br>LIME<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 1.5%<br>STATUS 1 STARTUP 12/77 | CANE RUN 5 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. THE BOILER SUPPLIES 700,000 ACFM OF FLUE GAS TO AN EMISSION CONTROL SYSTEM CONSISTING OF AN ESP FOLLOWED AND TWO COMBUSTION ENGINEERING 85% EFFICIENT (DESIGN) CARBIDE LIME SPRAY TOWERS. A STEAM TUBE REHEATER RAISES THE GAS TEMPERATURE 40 DEG F. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND THE SLUDGE IS POZ-O-TEC STABILIZED. OPERATION OF THIS RETROFIT SYSTEM BEGAN IN DECEMBER, 1977. |
| LOUISVILLE GAS & ELECTRIC<br>CANE RUN<br>6<br>RETROFIT 299.0 MW (GROSS)<br>299.0 MW (ESC)<br>COAL<br>4.80 %S BITUMINOUS<br>DUAL ALKALI<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: 1.0%<br>STATUS 1 STARTUP 4/79 | LOUISVILLE GAS AND ELECTRIC'S CANE RUN 6 IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A RETROFIT DUAL ALKALI DEMONSTRATION FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM, DESIGNED TO REMOVE 95% OF THE FLUE GAS SO2, CONSISTS OF A COLD SIDE ESP AND TWO TRAY TOWER MODULES. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND TWO DIRECT COMBUSTION REHEATERS BEFORE EXITING A 518 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED POND. FOR A ONE YEAR PERIOD FOLLOWING THE FIRST QUARTER OF OPERATION (WHICH BEGAN IN APRIL, 1979), THE U.S.EPA WILL SUBSIDIZE A MAX OF $4.5 MM FOR OPERATION, R&D, AND REPORT WRITING (NOT APPLIED TO ANY CAPITAL EXPENDITURES). |
| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK<br>1<br>RETROFIT 358.0 MW (GROSS)<br>358.0 MW (ESC)<br>COAL<br>3.75 %S<br>LIME<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 1.4%<br>STATUS 2 STARTUP 4/81 | MILL CREEK 1 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME/LIMESTONE FGD SYSTEM IS PRESENTLY UNDER CONSTRUCTION ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING IS SUPPLYING THE LIME/LIMESTONE FGD SYSTEM WHICH WILL COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL OF 1981. |
| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK<br>2<br>RETROFIT 350.0 MW (GROSS)<br>350.0 MW (ESC)<br>COAL<br>3.75 %S<br>LIME<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 1.4%<br>STATUS 2 STARTUP 4/82 | MILL CREEK 2 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME/LIMESTONE FGD SYSTEM IS PRESENTLY UNDER CONSTRUCTION ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING IS SUPPLYING THE LIME/LIMESTONE FGD SYSTEM WHICH WILL COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL OF 1982. |

| UNIT IDENTIFICATION | ABSTRACT |
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| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK<br>3<br>NEW 442.0 MW (GROSS)<br>442.0 MW (ESC)<br>COAL<br>3.75 %S BITUMINOUS<br>LIME<br>AMERICAN AIR FILTER<br>ENERGY CONSUMPTION: 1.6%<br>STATUS 1 STARTUP 8/78 | LOUISVILLE GAS AND ELECTRIC'S MILL CREEK 3 IS A 3.75% S COAL (11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. AMERICAN AIR FILTER SUPPLIED A CARBIDE LIME FGD SYSTEM FOR THIS UNIT WHICH WAS DESIGNED TO REMOVE 85% OF THE SO2 FROM THE FLUE GAS. AN ESP IS FOLLOWED BY FOUR MOBILE BED SPRAY TOWERS AND A STEAM TUBE REHEATER. THE WATER LOOP IS OPEN, AND THE FLYASH AND LIME STABILIZED SLUDGE IS PONDED. THIS UNIT HAS BEEN OPERATIONAL SINCE AUGUST, 1978. |
| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK<br>4<br>NEW 495.0 MW (GROSS)<br>495.0 MW (ESC)<br>COAL<br>3.75 %S<br>LIME<br>AMERICAN AIR FILTER<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 7/81 | MILL CREEK 4 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN LOUISVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP AND FOUR MOBILE BED SPRAY TOWERS. THE SYSTEM'S WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE STABILIZED WITH LIME AND FLYASH. STEAM TUBES WILL PROVIDE REHEAT OF THE CLEANED GASES. THE SYSTEM IS SCHEDULED TO START UP IN JULY OF 1981. |
| LOUISVILLE GAS & ELECTRIC<br>PADDY'S RUN<br>6<br>RETROFIT 72.0 MW (GROSS)<br>72.0 MW (ESC)<br>COAL<br>2.50 %S BITUMINOUS<br>LIME<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 2.8%<br>STATUS 1 STARTUP 4/73 | UNIT 6 AT LOUISVILLE GAS AND ELECTRIC'S PADDY'S RUN STATION IS A DRY BOTTOM PULVERIZED COAL (2.5% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. A RETROFIT CARBIDE LIME FGD SYSTEM BY COMBUSTION ENGINEERING TREATS 400,000 ACFM OF FLUE GAS FROM THE BOILER. AN ESP IS FOLLOWED BY TWO MARBLE BED ABSORBERS, A DIRECT COMBUSTION REHEATER, AND A 250 FOOT STACK. MIST ELIMINATION IS PROVIDED BY ONE CHEVRON/MODULE. THE LIME FIXATED SLUDGE IS TRUCKED TO AN UNLINED POND, AND THE WATER LOOP IS CLOSED. THE FGD SYSTEM BEGAN INITIAL OPERATIONS IN APRIL, 1973. |
| LOUISVILLE GAS & ELECTRIC<br>TRIMBLE COUNTY<br>1<br>NEW 575.0 MW (GROSS)<br>575.0 MW (ESC)<br>COAL<br>4.00 %S BITUMINOUS<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 7/84 | LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY'S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS' FLUE GAS WILL BE CLEANED BY ESP'S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 1 IS SCHEDULED FOR START UP IN JULY OF 1984. |
| LOUISVILLE GAS & ELECTRIC<br>TRIMBLE COUNTY<br>2<br>NEW 575.0 MW (GROSS)<br>575.0 MW (ESC)<br>COAL<br>4.00 %S BITUMINOUS<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 7/86 | LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY'S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS' FLUE GAS WILL BE CLEANED BY ESP'S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 2 IS SCHEDULED FOR START UP IN 1986. |
| MICHIGAN SO. CENTRAL PWR AGENC<br>PROJECT<br>1<br>NEW 55.0 MW (GROSS)<br>55.0 MW (ESC)<br>COAL<br>2.25 %S<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 7/82 | THE PROJECT 1 UNIT OF MICHIGAN SOUTH CENTRAL POWER AGENCY IS TO BE CONSTRUCTED IN LITCHFIELD, MICHIGAN, AND WILL UTILIZE A WET LIMESTONE FGD PROCESS. THE PULVERIZED COAL FIRED BOILER WILL FEED ITS FLUE GAS THROUGH A HOT SIDE ESP FOLLOWED BY A BABCOCK AND WILCOX LIMESTONE SPRAY TOWER. THE CLEANED GAS WILL PASS THROUGH A MIST ELIMINATOR BEFORE BEING WARMED BY AN IN-LINE REHEATER AND EXITING A 250 FOOT STACK. THE SLUDGE IS TO BE DISPOSED OFF SITE. START UP IS SCHEDULED FOR JULY, 1982. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| MIDDLE SOUTH UTILITIES<br>ARKANSAS COAL<br>5<br>NEW 890.0 MW (GROSS)<br>890.0 MW (ESC)<br>COAL<br>.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 1/86 | MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. ARKANSAS COAL 5 IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1986. |
| MIDDLE SOUTH UTILITIES<br>ARKANSAS COAL<br>6<br>NEW 890.0 MW (GROSS)<br>890.0 MW (ESC)<br>COAL<br>.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 1/88 | MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. ARKANSAS COAL 6 IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1988. |
| MIDDLE SOUTH UTILITIES<br>LOUISIANA COAL<br>1<br>NEW 890.0 MW (GROSS)<br>890.0 MW (ESC)<br>COAL<br>.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 0/86 | MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. LOUISIANA COAL 1 WILL START UP IN 1986. |
| MIDDLE SOUTH UTILITIES<br>LOUISIANA COAL<br>2<br>NEW 890.0 MW (GROSS)<br>890.0 MW (ESC)<br>COAL<br>.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 0/88 | MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. LOUISIANA COAL 2 WILL START UP IN 1988. |
| MIDDLE SOUTH UTILITIES<br>MISSISSIPPI COAL<br>1<br>NEW 890.0 MW (GROSS)<br>890.0 MW (ESC)<br>COAL<br>.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 0/85 | MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. MISSISSIPPI COAL 1 WILL START UP IN 1985. |
| MIDDLE SOUTH UTILITIES<br>MISSISSIPPI COAL<br>2<br>NEW 890.0 MW (GROSS)<br>890.0 MW (ESC)<br>COAL<br>.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 0/87 | MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. MISSISSIPPI COAL 2 WILL START UP IN 1987. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| MINNESOTA POWER & LIGHT<br>CLAY BOSWELL<br>4<br>NEW 554.0 MW (GROSS)<br>475.0 MW (ESC)<br>COAL<br>.94 %S SUBBITUMINOUS<br>LIME/ALKALINE FLYASH<br>PEABODY PROCESS SYSTEMS<br>ENERGY CONSUMPTION: 1.3%<br>STATUS 2 STARTUP 4/80 | CLAY BOSWELL 4 OF MINNESOTA POWER AND LIGHT IS A SUBBITUMINOUS COAL (0.54% S, 8896 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COHASSET, MINNESOTA. PEABODY PROCESS SYSTEMS WILL SUPPLY A LIME/ALKALINE FLYASH SYSTEM WHICH IS DESIGNED TO REMOVE 89% OF THE SO2 IN THE FLUE GAS. TWO HOT SIDE ESP'S WILL BE FOLLOWED BY VENTURI/SPRAY TOWER TRAINS. MIST ELIMINATION WILL BE PROVIDED BY A SIEVE TRAY FOLLOWED BY A SPIN VANE CHEVRON, AND REHEAT WILL BE PROVIDED BY BYPASSING 5% OF THE FLUE GAS. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE, AND THE SLUDGE WILL BE DISPOSED IN A LINED POND. OPERATIONS ARE SCHEDULED TO COMMENCE IN APRIL, 1980. |
| MINNKOTA POWER COOPERATIVE<br>MILTON R. YOUNG<br>2<br>NEW 440.0 MW (GROSS)<br>405.0 MW (ESC)<br>COAL<br>.70 %S LIGNITE<br>LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: 1.6%<br>STATUS 1 STARTUP 9/77 | MINNKOTA POWER COOPERATIVE'S MILTON R. YOUNG 2 IS A CYCLONE FIRED LIGNITE (0.70%S, 6500 BTU/LB) BOILER LOCATED IN CENTER, NORTH DAKOTA. THE BOILER PRODUCES 2,021,400 ACFM OF FLUE GAS, WHICH IS CLEANED BY TWO ESP'S AND TWO ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME/ALKALINE FLYASH SPRAY TOWERS (75% DESIGN SO2 REMOVAL EFFICIENCY). THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR BEFORE IT JOINS A 15% BYPASS REHEAT AND EXITS A 550 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS TRUCKED TO AN OFF-SITE MINEFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1977. |
| MONTANA POWER<br>COLSTRIP<br>1<br>NEW 360.0 MW (GROSS)<br>360.0 MW (ESC)<br>COAL<br>.77 %S SUBBITUMINOUS<br>LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: 3.3%<br>STATUS 1 STARTUP 9/75 | COLSTRIP 1 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN SEPTEMBER OF 1975. |
| MONTANA POWER<br>COLSTRIP<br>2<br>NEW 360.0 MW (GROSS)<br>360.0 MW (ESC)<br>COAL<br>.77 %S SUBBITUMINOUS<br>LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: 3.3%<br>STATUS 1 STARTUP 5/76 | COLSTRIP 2 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN MAY OF 1976. |
| MONTANA POWER<br>COLSTRIP<br>3<br>NEW 700.0 MW (GROSS)<br>700.0 MW (ESC)<br>COAL<br>.70 %S<br>LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 1/84 | MONTANA POWER'S COLSTRIP 3 IS A LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR JANUARY, 1984. |
| MONTANA POWER<br>COLSTRIP<br>4<br>NEW 700.0 MW (GROSS)<br>700.0 MW (ESC)<br>COAL<br>.70 %S<br>LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 0/84 | MONTANA POWER'S COLSTRIP 4 IS A LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR 1984. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| MUSCATINE POWER & WATER<br>MUSCATINE<br>9<br>NEW 166.0 MW (GROSS)<br>160.0 MW (ESC)<br>COAL<br>3.17 %S BITUMINOUS<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 4.8%<br>STATUS 3 STARTUP 9/82 | MUSCATINE 9 IS A PULVERIZED BITUMINOUS COAL (3% S, 11,200 BTU/LB) FIRED UNIT PLANNED BY MUSCATINE POWER AND WATER TO BE LOCATED IN MUSCATINE, IOWA. A CONTRACT WAS AWARDED TO RESEARCH COTTRELL FOR A LIMESTONE UNIT FOR EMISSION CONTROL. THE FGD SYSTEM WILL FEATURE AN ESP, TWO 100% CAPACITY TOWERS, STEAM COIL REHEAT, A CLOSED WATER LOOP, AND FORCED OXIDATION OF THE SLUDGE BEFORE LANDFILL. THE DESIGN SO2 REMOVAL WILL BE 94%. START UP WILL TAKE PLACE IN 1982. |
| NEVADA POWER<br>HARRY ALLEN<br>1<br>NEW 500.0 MW (GROSS)<br>500.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 6/86 | NEVADA POWER'S HARRY ALLEN 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1986. |
| NEVADA POWER<br>HARRY ALLEN<br>2<br>NEW 500.0 MW (GROSS)<br>500.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 6/87 | NEVADA POWER'S HARRY ALLEN 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1987. |
| NEVADA POWER<br>HARRY ALLEN<br>3<br>NEW 500.0 MW (GROSS)<br>500.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 6/88 | NEVADA POWER'S HARRY ALLEN 3 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1988. |
| NEVADA POWER<br>HARRY ALLEN<br>4<br>NEW 500.0 MW (GROSS)<br>500.0 MW (ESC)<br>COAL<br>***** %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 6/89 | NEVADA POWER'S HARRY ALLEN 4 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1989. |
| NEVADA POWER<br>REID GARDNER<br>1<br>RETROFIT 125.0 MW (GROSS)<br>125.0 MW (ESC)<br>COAL<br>.50 %S BITUMINOUS<br>SODIUM CARBONATE<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 4/74 | REID GARDNER 1 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1974. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| NEVADA POWER<br>REID GARDNER<br>2<br>RETROFIT 125.0 MW (GROSS)<br>125.0 MW (ESC)<br>COAL<br>.50 %S BITUMINOUS<br>SODIUM CARBONATE<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 4/74 | REID GARDNER 2 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1974. |
| NEVADA POWER<br>REID GARDNER<br>3<br>NEW 125.0 MW (GROSS)<br>125.0 MW (ESC)<br>COAL<br>.50 %S BITUMINOUS<br>SODIUM CARBONATE<br>ADL/COMBUSTION EQUIP ASSOCIATE<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 6/76 | REID GARDNER 3 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE, 1976. |
| NEVADA POWER<br>REID GARDNER<br>4<br>NEW 250.0 MW (GROSS)<br>250.0 MW (ESC)<br>COAL<br>.75 %S<br>SODIUM CARBONATE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 4/83 | REID GARDNER 4 OF NEVADA POWER IS A COAL (0.75% S, 12,450 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN MOAPA, NEVADA. THE UTILITY IS PRESENTLY EVALUATING BIDS FOR AN FGD SYSTEM AT THIS TIME. CONSTRUCTION IS EXPECTED TO BEGIN IN 1980, AND START UP IS EXPECTED IN 1983. |
| NEVADA POWER<br>WARNER VALLEY<br>1<br>NEW 295.0 MW (GROSS)<br>250.0 MW (ESC)<br>COAL<br>1.15 %S SUBBITUMINOUS<br>LIME<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 6/85 | NEVADA POWER'S WARNER VALLEY 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS PRESENTLY PREPARING SPECIFICATIONS FOR A SCRUBBING SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE OF 1985. |
| NEVADA POWER<br>WARNER VALLEY<br>2<br>NEW 295.0 MW (GROSS)<br>250.0 MW (ESC)<br>COAL<br>1.15 %S SUBBITUMINOUS<br>LIME<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 6/86 | NEVADA POWER'S WARNER VALLEY 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS PRESENTLY PREPARING SPECIFICATIONS FOR A SCRUBBING SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE OF 1986. |
| NEW YORK STATE ELEC & GAS<br>SOMERSET<br>1<br>NEW 870.0 MW (GROSS)<br>870.0 MW (ESC)<br>COAL<br>2.20 %S BITUMINOUS<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 6/84 | THE SOMERSET 1 UNIT OF THE NEW YORK STATE ELECTRIC & GAS CORP. IS A PULVERIZED COAL BOILER LOCATED IN SOMERSET, NEW YORK. THE BOILER GENERATES A FLUE GAS FLOW OF 3,100,000 ACFM AND FIRES A BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 2.4% AND AN AVERAGE HEAT CONTENT OF 12,400 BTU/LB. A COLD SIDE ESP WITH A DESIGN EFFICIENCY OF 99.77% WILL PROVIDE THE PRIMARY PARTICULATE REMOVAL. A LIMESTONE ABSORBER WITH A DESIGN REMOVAL EFFICIENCY OF 90% WILL BE USED FOR SO2 REMOVAL. THE SYSTEM WILL OPERATE IN A CLOSED LOOP MODE. THE SLUDGE IS TO BE DEWATERED AND STABILIZED BEFORE BEING LANDFILLED. |

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| NIAGARA MOHAWK POWER COOP<br>CHARLES R. HUNTLEY<br>66<br>RETROFIT 100.0 MW (GROSS)<br>100.0 MW (ESC)<br>COAL<br>1.80 %S<br>AQUEOUS CARBONATE<br>ROCKWELL INTERNATIONAL<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 4/82 | CHARLES R. HUNTLEY 66 OF NIAGARA POWER COOP IS A PULVERIZED COAL (1.8% S, 12,500 BTU/LB) FIRED UNIT LOCATED IN BUFFALO, NEW YORK. A CONTRACT WAS AWARDED TO ATOMICS INTERNATIONAL FOR THE DESIGN AND INSTALLATION OF A 90% EFFICIENT RETROFIT AQUEOUS CARBONATE FGD SYSTEM WHICH WILL PRODUCE ELEMENTAL SULFUR AS AN END PRODUCT. FUNDS ARE BEING PROVIDED BY THE U.S.EPA AND THE EMPIRE STATE ELECTRIC ENERGY RESEARCH CORP. A SPRAY DRYER WILL BE FOLLOWED BY TWO BANKS OF EIGHT CYCLONES AN ESP, AND A 200 FOOT STEEL LINED STACK. THE WATER LOOP WILL BE OPEN. START UP OF THE FGD SYSTEM WILL BE IN 1982. |
| NORTHERN INDIANA PUB SERVICE<br>DEAN H. MITCHELL<br>11<br>RETROFIT 115.0 MW (GROSS)<br>115.0 MW (ESC)<br>COAL<br>3.50 %S<br>WELLMAN LORD<br>DAVY POWERGAS<br>ENERGY CONSUMPTION: 27.8%<br>STATUS 1 STARTUP 7/76 | NORTHERN INDIANA PUBLIC SERVICE'S DEAN H. MITCHELL 11 IS A COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT LOCATED IN GARY, INDIANA. A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS HAS BEEN OPERATING ON THIS UNIT SINCE JULY, 1976. AN ESP IS FOLLOWED BY A VARIABLE THROAT VENTURI SCRUBBER AND A TRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL EFFICIENCY). A DIRECT COMBUSTION RAISES THE CLEANED GAS TEMPERATURE 50 DEG F BEFORE THE GAS IS DISCHARGED THROUGH A 168 FOOT STAINLESS STEEL AND FRP LINED STACK. ELEMENTAL SULFUR AND SULFATE IS PRODUCED BY THE PROCESS DEVELOPED BY ALLIED CHEMICAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. |
| NORTHERN INDIANA PUB SERVICE<br>SCHAHFER<br>17<br>NEW 421.0 MW (GROSS)<br>421.0 MW (ESC)<br>COAL<br>3.20 %S BITUMINOUS<br>DUAL ALKALI<br>FMC<br>ENERGY CONSUMPTION: ****%<br>STATUS 4 STARTUP 6/83 | SCHAHFER 17 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH FMC FOR THE INSTALLATION OF A DUAL ALKALI FGD SYSTEM AT THIS UNIT. PARTICULATE MATTER WILL BE COLLECTED BY AN ESP AND THE SYSTEM WILL INCLUDE A REHEATER. START UP OF THIS UNIT IS SCHEDULED FOR JUNE OF 1983. |
| NORTHERN INDIANA PUB SERVICE<br>SCHAHFER<br>18<br>NEW 421.0 MW (GROSS)<br>421.0 MW (ESC)<br>COAL<br>3.20 %S BITUMINOUS<br>DUAL ALKALI<br>FMC<br>ENERGY CONSUMPTION: ****%<br>STATUS 4 STARTUP 6/85 | SCHAHFER 18 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH FMC FOR THE INSTALLATION OF A DUAL ALKALI FGD SYSTEM AT THIS UNIT. PARTICULATE MATTER WILL BE COLLECTED BY AN ESP AND THE SYSTEM WILL INCLUDE A REHEATER. START UP OF THIS UNIT IS SCHEDULED FOR JUNE OF 1985. |
| NORTHERN STATES POWER<br>RIVERSIDE<br>6,7<br>RETROFIT 110.0 MW (GROSS)<br>110.0 MW (ESC)<br>COAL<br>1.50 %S<br>LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 7/80 | RIVERSIDE 6 AND 7 ARE TWO COAL FIRED BOILERS OWNED BY NORTHERN STATES POWER AND LOCATED IN MINNEAPOLIS, MINNESOTA. EACH BOILER GENERATES A FLUE GAS FLOW OF 320,000 ACFM AT 350 F. CURRENTLY, A DEMONSTRATION LIME/SPRAY DRYING FGD SYSTEM IS UNDER CONSTRUCTION THAT WILL BE CAPABLE OF TREATING THE FLUE GAS FROM BOTH BOILERS. THE SYSTEM IS BEING SUPPLIED BY NIRO ATOMIZER/JOY MANUFACTURING AND WILL CONSIST OF A SPRAY DRYER FOLLOWED BY A BAGHOUSE. THE CLEAN FLUE GAS WILL BE VENTED TO TWO 300 FT CONCRETE STACKS WITH FIRE BRICK LINERS. SPENT ABSORBENT WILL BE DISPOSED OF IN ON AND OFF SITE LANDFILLS. OPERATIONS ARE EXPECTED TO BEGIN IN JULY, 1980. |
| NORTHERN STATES POWER<br>SHERBURNE<br>1<br>NEW 740.0 MW (GROSS)<br>740.0 MW (ESC)<br>COAL<br>.80 %S SUBBITUMINOUS<br>LIMESTONE/ALKALINE FLYASH<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 2.7%<br>STATUS 1 STARTUP 3/76 | NORTHERN STATES POWER'S SHERBURNE 1 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE MARCH OF 1976. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| NORTHERN STATES POWER<br>SHERBURNE<br>2<br>NEW 740.0 MW (GROSS)<br>740.0 MW (ESC)<br>COAL<br>.80 %S SUBBITUMINOUS<br>LIMESTONE/ALKALINE FLYASH<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: 2.7%<br>STATUS 1 STARTUP 4/77 | NORTHERN STATES POWER'S SHERBURNE 2 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE APRIL OF 1977. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN. |
| NORTHERN STATES POWER<br>SHERBURNE<br>3<br>NEW 860.0 MW (GROSS)<br>860.0 MW (ESC)<br>COAL<br>.80 %S<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 5/84 | NORTHERN STATES POWER'S SHERBURNE 3 IS A PLANNED TANGENTIAL FIRED PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED UNIT TO BE CONSTRUCTED IN BECKER, MINNESOTA. DUE TO THE LATEST TECHNOLOGY THAT HAS BEEN DEVELOPED BIDS HAVE AGAIN BEEN OPENED. THE UTILITY IS PRESENTLY EVALUATING THREE DIFFERENT TYPES OF FGD SYSTEMS. MAY, 1984 IS EXPECTED START UP. |
| OTTER TAIL POWER<br>COYOTE<br>1<br>NEW 440.0 MW (GROSS)<br>440.0 MW (ESC)<br>COAL<br>.87 %S LIGNITE<br>AQUEOUS CARBONATE/SPRAY DRYING<br>WHEELABRATOR-FRYE/R.I.<br>ENERGY CONSUMPTION: 1.1%<br>STATUS 2 STARTUP 3/81 | COYOTE 1 IS A CYCLONE FIRED PULVERIZED LIGNITE (0.875% S, 7050 BTU/LB) BOILER UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT IS JOINTLY OWNED BY FIVE UTILITIES, WITH OTTER TAIL POWER BEING THE MAJOR OWNER AND CONSTRUCTOR. AN AQUEOUS CARBONATE DRY FGD SYSTEM DESIGNED TO REMOVE 70% OF THE SO2 IS BEING SUPPLIED BY WHEELABRATOR-FRYE AND ATOMICS INTERNATIONAL. THE SPRAY DRYER/BAGHOUSE SYSTEM IS SCHEDULED TO START UP IN 1981. |
| PACIFIC GAS & ELECTRIC<br>MONTEZUMA<br>1<br>NEW 800.0 MW (GROSS)<br>800.0 MW (ESC)<br>COAL<br>.80 %S SUBBITUMINOUS<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 3.5%<br>STATUS 6 STARTUP 6/87 | MONTEZUMA 1 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP DATE IS JUNE, 1987. |
| PACIFIC GAS & ELECTRIC<br>MONTEZUMA<br>2<br>NEW 800.0 MW (GROSS)<br>800.0 MW (ESC)<br>COAL<br>.80 %S SUBBITUMINOUS<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 3.5%<br>STATUS 6 STARTUP 6/88 | MONTEZUMA 2 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP DATE IS JUNE, 1988. |
| PACIFIC POWER & LIGHT<br>JIM BRIDGER<br>4<br>NEW 550.0 MW (GROSS)<br>550.0 MW (ESC)<br>COAL<br>.56 %S SUBBITUMINOUS<br>SODIUM CARBONATE<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: .2%<br>STATUS 1 STARTUP 9/79 | PACIFIC POWER AND LIGHT'S JIM BRIDGER 4 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56% S, 9300 BTU/LB) FIRED BOILER LOCATED IN ROCK SPRINGS, WYOMING. A 91% EFFICIENT SODIUM CARBONATE FGD SYSTEM FOR THIS UNIT WAS SUPPLIED BY THE AIR CORRECTION DIVISION OF UOP. A COLD SIDE ESP TREATS 2,720,000 ACFM OF FLUE GAS, FOLLOWED BY THREE SIEVE TRAY ABSORBERS. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. A SYSTEM CHECK OUT WAS CONDUCTED IN JULY OF 1979, AND OPERATIONS BEGAN IN SEPTEMBER, 1979. |

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| PENNSYLVANIA POWER<br>BRUCE MANSFIELD<br>1<br>NEW 917.0 MW (GROSS)<br>917.0 MW (ESC)<br>COAL<br>3.00 %S BITUMINOUS<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: 6.0%<br>STATUS 1 STARTUP 12/75 | BRUCE MANSFIELD 1 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS, AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE DECEMBER, 1975. |
| PENNSYLVANIA POWER<br>BRUCE MANSFIELD<br>2<br>NEW 917.0 MW (GROSS)<br>917.0 MW (ESC)<br>COAL<br>3.00 %S BITUMINOUS<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: 6.0%<br>STATUS 1 STARTUP 7/77 | BRUCE MANSFIELD 2 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS, AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY, 1977. |
| PENNSYLVANIA POWER<br>BRUCE MANSFIELD<br>3<br>NEW 917.0 MW (GROSS)<br>917.0 MW (ESC)<br>COAL<br>3.00 %S<br>LIME<br>PULLMAN KELLOGG<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 10/80 | BRUCE MANSFIELD 3 OF PENNSYLVANIA POWER IS A SUPERCRITICAL PULVERIZED COAL (3.0% S, 11,500 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SHIPPINGPORT, PENNSYLVANIA. FOUR ESP'S WILL TREAT 3,308,000 ACFM OF FLUE GAS, FOLLOWED BY FIVE (ONE SPARE) PULLMAN KELLOGG THIOSORBIC LIME ABSORBERS WHICH WILL REMOVE 92.2% OF THE SO2. THE CLEANED GAS WILL PASS THROUGH CHEVRON MIST ELIMINATORS AND DIRECT COMBUSTION REHEATERS BEFORE DISCHARGE THROUGH A 600 FOOT INCONEL 625 LINED STACK. THE FLYASH STABILIZED SLUDGE WILL BE PIPED TO THE EXISTING OFF SITE LANDFILL PRESENTLY USED BY UNITS ONE AND TWO. START UP IS EXPECTED IN OCTOBER, 1980. |
| PHILADELPHIA ELECTRIC<br>CROMBY<br><br>RETROFIT 150.0 MW (GROSS)<br>150.0 MW (ESC)<br>COAL<br>3.00 %S<br>MAGNESIUM OXIDE<br>UNITED ENGINEERS<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 12/82 | PHILADELPHIA ELECTRIC HAS PLANS FOR THE RETROFIT OF AN FGD SYSTEM ON ONE OF THE TWO 3.0% SULFUR COAL FIRED BOILERS AT CROMBY STATION IN PHOENIXVILLE, PENNSYLVANIA. A CONTRACT HAS BEEN AWARDED TO UNITED ENGINEERS FOR A MAGNESIUM OXIDE SYSTEM. THE START UP DATE IS SET FOR 1982. |
| PHILADELPHIA ELECTRIC<br>EDDYSTONE<br>1A<br>RETROFIT 120.0 MW (GROSS)<br>120.0 MW (ESC)<br>COAL<br>2.60 %S BITUMINOUS<br>MAGNESIUM OXIDE<br>UNITED ENGINEERS<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 9/75 | UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.6% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICULATE SCRUBBERS (TWO VENTRI ROD AND ONE VENTURI) PROVIDE PRIMARY PARTICULATE CONTROL. THE 1A FGD SYSTEM CONSISTS OF A MAG OX ROD DECK SPRAY TOWER FOLLOWING THE VENTURI SCRUBBER. THE 90% EFFICIENT (DESIGN) ABSORBER, A RETROFIT BY UNITED ENGINEERS, LEADS TO A LOUVER TYPE MIST ELIMINATOR, A DIRECT COMBUSTION REHEATER, AND A 249 FOOT STACK. THE SPENT SLURRY IS REGENERATED AT THE ESSEX SULFURIC ACID PLANT IN NEWARK, NEW JERSEY, AND THE MAG-OX IS RETURNED TO EDDYSTONE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1975. |
| PHILADELPHIA ELECTRIC<br>EDDYSTONE<br>1B<br>RETROFIT 240.0 MW (GROSS)<br>240.0 MW (ESC)<br>COAL<br>2.60 %S<br>MAGNESIUM OXIDE<br>UNITED ENGINEERS<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 12/82 | UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.6% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICULATE SCRUBBERS (TWO ROD DECK SPRAY TOWERS AND ONE VENTURI) FOR PRIMARY PARTICULATE CONTROL. THE 1B FGD WILL FOLLOW THE TWO ROD DECK SPRAY TOWERS. UNITED ENGINEERS WILL SUPPLY A MAGNESIUM OXIDE FGD SYSTEM FOR EMISSION CONTROL. THE START UP DATE IS SET FOR DECEMBER, 1982. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| PHILADELPHIA ELECTRIC<br>EDDYSTONE<br>2<br>RETROFIT 334.0 MW (GROSS)<br>334.0 MW (ESC)<br>COAL<br>2.50 %S<br>MAGNESIUM OXIDE<br>UNITED ENGINEERS<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 12/82 | EDDYSTONE 2 OF PHILADELPHIA ELECTRIC IS A 2.5% SULFUR COAL FIRED BOILER LOCATED IN EDDYSTONE, PENNSYLVANIA. THE PLANT'S GENERATING CAPACITY IS 334 MW. UNITED ENGINEERS WILL SUPPLY A MAGNESIUM OXIDE FGD SYSTEM FOR EMISSION CONTROL. START UP IS SET FOR DECEMBER, 1982. |
| POTOMAC ELECTRIC POWER<br>DICKERSON<br>4<br>NEW 850.0 MW (GROSS)<br>800.0 MW (ESC)<br>COAL<br>1.90 %S BITUMINOUS<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 5/87 | DICKERSON 4 OF POTOMAC ELECTRIC POWER IS A PULVERIZED COAL (2.0% S, 11,000 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN DICKERSON, MARYLAND. THE UTILITY IS CONSIDERING AN FGD SYSTEM FOR THIS UNIT, BUT THERE ARE NO FIRM PLANS FOR THE INSTALLATION OF AN FGD SYSTEM. START UP OF THE BOILER IS EXPECTED IN 1985. FGD SYSTEM START UP IS EXPECTED IN MAY, 1987. |
| PUBLIC SERVICE INDIANA<br>GIBSON<br>5<br>NEW 650.0 MW (GROSS)<br>650.0 MW (ESC)<br>COAL<br>3.30 %S<br>LIMESTONE<br>PULLMAN KELLOGG<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 0/82 | GIBSON 5 OF PUBLIC SERVICE OF INDIANA IS A 3.3% SULFUR COAL FIRED UNIT PLANNED FOR LOCATION IN PRINCETON, INDIANA. A CONTRACT WAS AWARDED TO PULLMAN KELLOGG FOR A LIMESTONE FGD SYSTEM CONSISTING OF FOUR KELLOGG-WEIR ABSORBER-REACTOR MODULES. SYSTEM START UP IS EXPECTED IN 1982. THE SYSTEM WILL USE KELLOGG'S PROPRIETARY MAGNESIUM-PROMOTED LIMESTONE. |
| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN<br>1<br>RETROFIT 361.0 MW (GROSS)<br>361.0 MW (ESC)<br>COAL<br>.60 %S SUBBITUMINOUS<br>WELLMAN LORD<br>DAVY POWERGAS<br>ENERGY CONSUMPTION: 4.4%<br>STATUS 1 STARTUP 4/78 | SAN JUAN 1 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE APRIL OF 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED. |
| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN<br>2<br>RETROFIT 350.0 MW (GROSS)<br>350.0 MW (ESC)<br>COAL<br>.60 %S SUBBITUMINOUS<br>WELLMAN LORD<br>DAVY POWERGAS<br>ENERGY CONSUMPTION: 4.6%<br>STATUS 1 STARTUP 8/78 | SAN JUAN 2 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.6% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE AUGUST OF 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED. |
| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN<br>3<br>NEW 534.0 MW (GROSS)<br>534.0 MW (ESC)<br>COAL<br>.80 %S SUBBITUMINOUS<br>WELLMAN LORD<br>DAVY POWERGAS<br>ENERGY CONSUMPTION: 3.6%<br>STATUS 1 STARTUP 12/79 | SAN JUAN 3 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO AND IS LOCATED IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM, SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER BOOSTS THE GAS TEMPERATURE 50 DEG F. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. OPERATIONS COMMENCED IN DECEMBER, 1979. |

| UNIT IDENTIFICATION | ABSTRACT |
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| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN<br>4<br>NEW 534.0 MW (GROSS)<br>534.0 MW (ESC)<br>COAL<br>.80 %S SUBBITUMINOUS<br>WELLMAN LORD<br>DAVY POWERGAS<br>ENERGY CONSUMPTION: 3.6%<br>STATUS 2 STARTUP 6/82 | SAN JUAN 4 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO UNDER CONSTRUCTION IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM BEING SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS WILL FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER WILL BOOST THE GAS TEMPERATURE 50 DEG F. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP IS EXPECTED IN JUNE, 1982. |
| PWR AUTHORITY OF STATE OF NY<br>FOSSIL<br><br>NEW 700.0 MW (GROSS)<br>700.0 MW (ESC)<br>COAL<br>3.00 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 11/87 | THE POWER AUTHORITY OF NEW YORK PLANS A NEW 3.0% SULFUR COAL FIRED UNIT WHICH WILL BE LOCATED AT THE ARTHUR KILL FACILITY ON STATEN ISLAND. THE UTILITY IS PRESENTLY CONSIDERING FGD SYSTEMS FOR THIS UNIT. PUBLIC SERVICE COMMISSION HEARINGS ARE CURRENTLY IN PROGRESS. START UP IS EXPECTED IN NOVEMBER, 1987. |
| SALT RIVER PROJECT<br>CORONADO<br>1<br>NEW 350.0 MW (GROSS)<br>280.0 MW (ESC)<br>COAL<br>1.00 %S SUBBITUMINOUS<br>LIMESTONE<br>PULLMAN KELLOGG<br>ENERGY CONSUMPTION: 4.3%<br>STATUS 1 STARTUP 11/79 | SALT RIVER PROJECT'S CORONADO 1 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER LOCATED IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG SUPPLIED THE TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH WILL REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS PROVIDES REHEAT. THE WATER LOOP IS AN OPEN MODE, AND THE UNSTABILIZED SLUDGE IS DISPOSED IN AN UNLINED POND. START UP WAS IN NOVEMBER, 1979. |
| SALT RIVER PROJECT<br>CORONADO<br>2<br>NEW 350.0 MW (GROSS)<br>280.0 MW (ESC)<br>COAL<br>1.00 %S SUBBITUMINOUS<br>LIMESTONE<br>PULLMAN KELLOGG<br>ENERGY CONSUMPTION: 4.3%<br>STATUS 2 STARTUP 7/80 | SALT RIVER PROJECT'S CORONADO 2 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG IS SUPPLYING TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH WILL REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS WILL PROVIDE REHEAT. THE WATER LOOP WILL BE OPEN, AND THE UNSTABILIZED SLUDGE WILL BE DISPOSED IN AN UNLINED POND. START UP IS EXPECTED IN JULY, 1980. |
| SALT RIVER PROJECT<br>CORONADO<br>3<br>NEW 400.0 MW (GROSS)<br>280.0 MW (ESC)<br>COAL<br>.60 %S SUBBITUMINOUS<br>LIMESTONE<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: 3.8%<br>STATUS 6 STARTUP 6/87 | CORONADO 3 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED UNIT PLANNED BY SALT RIVER PROJECT TO BE LOCATED IN ST. JOHN'S, ARIZONA. THE UTILITY IS PRESENTLY CONSIDERING THE INSTALLATION OF TWO HORIZONTAL SPRAY TOWERS UTILIZING LIMESTONE AS THE ABSORBENT. PLANS FOR AN EMISSION CONTROL SYSTEM HAVE NOT BEEN FINALIZED. THE SYSTEM WILL HAVE A 20% BYPASS REHEAT, AND THE SLUDGE WILL PROBABLY BE PONDED. SCHEDULED OPERATION DATE IS 1987. |
| SAN MIGUEL ELECTRIC COOP<br>SAN MIGUEL<br>1<br>NEW 400.0 MW (GROSS)<br>400.0 MW (ESC)<br>COAL<br>1.70 %S LIGNITE<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: 5.0%<br>STATUS 2 STARTUP 9/80 | SAN MIGUEL 1 OF THE SAN MIGUEL ELECTRIC COOP IS A LIGNITE (1.7% S, 5000 BTU/LB) FIRED RADIANT BOILER UNDER CONSTRUCTION IN SAN MIGUEL, TEXAS. THE EMISSION CONTROL SYSTEM ON THIS UNIT WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY FOUR BABCOCK AND WILCOX 86% EFFICIENT LIMESTONE TCA MODULES. CHEVRON MIST ELIMINATORS WILL PRECEDE AN IN-LINE REHEATER AND AN ACID BRICK LINED STACK. THE WATER LOOP WILL BE CLOSED, AND THE DEWATERED SLURRY WILL BE MIXED WITH FLYASH BY RESEARCH COTTRELL AND DISPOSED IN AN OFF SITE LANDFILL. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| SEMINOLE ELECTRIC<br>SEMINOLE<br>1<br>NEW 620.0 MW (GROSS)<br>620.0 MW (ESC)<br>COAL<br>2.75 %S SUBBITUMINOUS<br>LIMESTONE<br>PEABODY PROCESS SYSTEMS<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 3/83 | SEMINOLE 1 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE FGD SYSTEM WILL BE SUPPLIED BY PEABODY PROCESS SYSTEM. START UP IS EXPECTED IN MARCH OF 1983. |
| SEMINOLE ELECTRIC<br>SEMINOLE<br>2<br>NEW 620.0 MW (GROSS)<br>620.0 MW (ESC)<br>COAL<br>2.75 %S SUBBITUMINOUS<br>LIMESTONE<br>PEABODY PROCESS SYSTEMS<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 3/85 | SEMINOLE 2 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE FGD SYSTEM WILL BE SUPPLIED BY PEABODY SYSTEMS. START UP IS EXPECTED IN MARCH OF 1985. |
| SIKESTON BOARD OF MUNIC. UTIL.<br>SIKESTON<br>1<br>NEW 235.0 MW (GROSS)<br>235.0 MW (ESC)<br>COAL<br>2.80 %S<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: 1.6%<br>STATUS 2 STARTUP 1/81 | THE SIKESTON BOARD OF MUNICIPAL UTILITIES' SIKESTON 1 IS A PULVERIZED COAL (2.8% S, 11,340 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SIKESTON, MISSOURI. BABCOCK AND WILCOX IS SUPPLYING AN EMISSION CONTROL SYSTEM CONSISTING OF TWO ESP'S AND THREE 50% CAPACITY LIMESTONE VENTURI FGD MODULES. THE CLEANED GAS WILL PASS THROUGH CHEVRON MIST ELIMINATORS BEFORE EXITING A 450 FOOT FRP LINED FLUE (A SECOND CARBON STEEL LINED FLUE, USED FOR EMERGENCY BYPASS, IS ALSO IN THE STACK). THE WATER LOOP WILL BE OPEN, AND THE SLUDGE WILL BE PONDED. START UP IS SLATED FOR JANUARY, 1981. |
| SOUTH CAROLINA PUBLIC SERVICE<br>WINYAH<br>2<br>NEW 280.0 MW (GROSS)<br>140.0 MW (ESC)<br>COAL<br>1.70 %S BITUMINOUS<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: 1.1%<br>STATUS 1 STARTUP 7/77 | WINYAH 2 OF SOUTH CAROLINA PUBLIC SERVICE IS A PULVERIZED BITUMINOUS COAL (1.70% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN GEORGETOWN, SOUTH CAROLINA. A COLD SIDE ESP AND A BABCOCK AND WILCOX VENTURI SCRUBBER/LIMESTONE TRAY TOWER ABSORBER TRAIN DESIGNED TO REMOVE 69% OF THE SO2 FROM THE BOILER FLUE GAS MAKE UP THE EMISSION CONTROL SYSTEM ON THIS UNIT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY OF 1977. |
| SOUTH CAROLINA PUBLIC SERVICE<br>WINYAH<br>3<br>NEW 280.0 MW (GROSS)<br>280.0 MW (ESC)<br>COAL<br>1.70 %S<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: 2.1%<br>STATUS 2 STARTUP 5/80 | WINYAH 3 IS A DRY BOTTOM BOILER UNDER CONSTRUCTION BY SOUTH CAROLINA PUBLIC SERVICE WHICH WILL BURN 1.7% SULFUR COAL (11,500 BTU/LB) IN GEORGETOWN, SOUTH CAROLINA. AN ESP WILL PRECEDE A BABCOCK AND WILCOX LIMESTONE FGD SYSTEM AND AN INDIRECT STEAM REHEATER. THE WATER LOOP WILL BE CLOSED. EXPECTED START UP DATE IS MAY, 1980. |
| SOUTH CAROLINA PUBLIC SERVICE<br>WINYAH<br>4<br>NEW 280.0 MW (GROSS)<br>280.0 MW (ESC)<br>COAL<br>1.70 %S BITUMINOUS<br>LIMESTONE<br>AMERICAN AIR FILTER<br>ENERGY CONSUMPTION: 2.1%<br>STATUS 3 STARTUP 7/81 | SOUTH CAROLINA PUBLIC SERVICE'S WINYAH 4 IS A PLANNED BITUMINOUS COAL (1.7% S, 11,500 BTU/LB) FIRED UNIT TO BE LOCATED IN GEORGETOWN, SOUTH CAROLINA. TWO AMERICAN AIR FILTER LIMESTONE SLURRY SPRAY TOWERS WILL FOLLOW AN ESP. THE TEMPERATURE OF THE CLEANED GAS WILL BE RAISED BY AN INDIRECT STEAM REHEATER. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. THE CONTRACT FOR THE FGD SYSTEM HAS BEEN AWARDED, AND START UP IS EXPECTED IN JULY, 1981. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
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| SOUTH MISSISSIPPI ELEC PWR<br>R.D. MORROW<br>1<br>NEW 200.0 MW (GROSS)<br>124.0 MW (ESC)<br>COAL<br>1.30 %S BITUMINOUS<br>LIMESTONE<br>RILEY STOKER/ENVIRONEERING<br>ENERGY CONSUMPTION: 5.5%<br>STATUS 1 STARTUP 8/78 | R.D. MORROW 1 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST OF 1978. |
| SOUTH MISSISSIPPI ELEC PWR<br>R.D. MORROW<br>2<br>NEW 200.0 MW (GROSS)<br>124.0 MW (ESC)<br>COAL<br>1.30 %S BITUMINOUS<br>LIMESTONE<br>RILEY STOKER/ENVIRONEERING<br>ENERGY CONSUMPTION: 5.5%<br>STATUS 1 STARTUP 6/79 | R.D. MORROW 2 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE OF 1979. |
| SOUTHERN ILLINOIS POWER COOP<br>MARION<br>4<br>NEW 184.0 MW (GROSS)<br>184.0 MW (ESC)<br>COAL/REFUS<br>3.50 %S<br>LIMESTONE<br>BABCOCK & WILCOX<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 5/79 | UNIT 4 AT SOUTHERN ILLINOIS POWER COOP'S MARION STATION IN MARION, ILLINOIS IS A CYCLONE FIRED COAL (3.0% S, 9000 BTU/LB) BOILER WHICH IS SERVED BY A 89.4% EFFICIENT (DESIGN) LIMESTONE FGD SYSTEM SUPPLIED BY BABCOCK AND WILCOX. TWO SPRAY TOWERS AND A BRICK LINED STACK ARE DOWNSTREAM OF AN ESP IN THIS SYSTEM. THE WATER LOOP IS OPEN, AND THE FLYASH STABILIZED SLUDGE IS DEWATERED AND LANDFILLED. THE SYSTEM BECAME OPERATIONAL DURING MAY OF 1979. |
| SOUTHERN ILLINOIS POWER COOP<br>MARION<br>5<br>NEW 300.0 MW (GROSS)<br>300.0 MW (ESC)<br>COAL<br>3.00 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/86 | MARION 5 IS A COAL (3.0% S, 9000 BTU/LB) FIRED UNIT PLANNED BY SOUTHERN ILLNOIS POWER COOP FOR LOCATION IN MARION, ILLINOIS. THE UTILITY HAS NOT YET DECIDED ON AN FGD PROCESS AS IT IS WAITING FOR THE FINALIZATION OF THE SO2 REGULATIONS THE UNIT WILL HAVE TO MEET. START UP IS EXPECTED IN 1986. |
| SOUTHERN INDIANA GAS & ELEC<br>A.B. BROWN<br>1<br>NEW 265.0 MW (GROSS)<br>265.0 MW (ESC)<br>COAL<br>3.35 %S BITUMINOUS<br>DUAL ALKALI<br>FMC<br>ENERGY CONSUMPTION: .8%<br>STATUS 1 STARTUP 4/79 | SOUTHERN INDIANA GAS AND ELECTRIC'S A.B.BROWN 1 IS A DRY BOTTOM PULVERIZED COAL (4.5% S, 13,010 BTU/LB) FIRED UNIT IN WEST FRANKLIN, INDIANA. FMC SUPPLIED A DUAL ALKALI FGD SYSTEM DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. THE UNIT CONSISTS OF TWO THREE STAGE DISC CONTACTORS. A COLD SIDE ESP PROVIDES PRIMARY PARTICULATE CONTROL, AND ONE CHEVRON MIST ELIMINATOR/MODULE PRECEDES A 498 FOOT ACID BRICK LINED STACK. THE SYSTEM PRODUCES A FILTER CAKE WASTE PRODUCT WHICH IS DISPOSED IN AN ON SITE LANDFILL. THE WATER LOOP CAN BE EITHER OPEN OR CLOSED. THE SYSTEM HAS BEEN OPERATIONAL SINCE MARCH OF 1979. |
| SOUTHWESTERN ELECTRIC POWER<br>HENRY W. PIRKEY<br>1<br>NEW 720.0 MW (GROSS)<br>720.0 MW (ESC)<br>COAL<br>.80 %S LIGNITE<br>LIMESTONE<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 12/84 | HENRY W. PERKEY 1 IS A WET BOTTOM LIGNITE (0.8% S, 6300 BTU/LB) FIRED UNIT PLANNED BY SOUTHWESTERN ELECTRIC POWER FOR LOCATION IN HALLSVILLE, TEXAS. A CONTRACT HAS BEEN AWARDED TO THE AIR CORRECTION DIVISION OF UOP FOR FOUR LIMESTONE SPRAY TOWERS (99+% EFFICIENCY). MIST ELIMINATION WILL BE PROVIDED BY TWO STAGE CHEVRONS, AND THE STACK WILL BE ACID BRICK LINED. NO REHEAT IS PLANNED. THE WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE POZ-O-TEC STABILIZED. START UP IS EXPECTED BY DECEMBER, 1984. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| SPRINGFIELD CITY UTILITIES<br>SOUTHWEST<br>1<br>NEW 194.0 MW (GROSS)<br>194.0 MW (ESC)<br>COAL<br>3.50 %S BITUMINOUS<br>LIMESTONE<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: 4.6%<br>STATUS 1 STARTUP 4/77 | SPRINGFIELD CITY UTILITIES' SOUTHWEST 1 IS A PULVERIZED BITUMINOUS COAL (3.5% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN SPRINGFIELD, MISSOURI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY TWO UOP LIMESTONE TCA MODULES WHICH WERE DESIGNED TO REMOVE 80% OF THE FLUE GAS SO2. ONE CHEVRON/MODULE LEADS TO A 384 FOOT CEILCOTE LINED STACK. THE DRY FLYASH STABILIZED SLUDGE IS DEWATERED BY A ROTARY DRUM VACUUM AND TRUCKED TO A LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1977. |
| SPRINGFIELD WATER, LIGHT & PWR<br>DALLMAN<br>3<br>NEW 205.0 MW (GROSS)<br>205.0 MW (ESC)<br>COAL<br>3.30 %S<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 5.9%<br>STATUS 2 STARTUP 11/80 | DALLMAN 3 OF SPRINGFIELD WATER, LIGHT, AND POWER IS A PULVERIZED COAL (3.3% S, 10,500 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SPRINGFIELD, ILLINOIS. RESEARCH COTTRELL IS SUPPLYING A LIMESTONE FGD SYSTEM DESIGNED TO REMOVE 95% OF THE SO2 FROM 850,000 ACFM OF BOILER FLUE GAS. A HOT SIDE ESP WILL PRECEDE TWO PACKED TOWER ABSORBERS, ONE HORIZONTAL CHEVRON PER MODULE, AND A 500 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE PROVIDED. A SLUDGE DISPOSAL STRATEGY HAS NOT BEEN FINALIZED, BUT THE UTILITY IS CONSIDERING EITHER PONDING OR LANDFILL. FGD OPERATIONS SHOULD BEGIN IN NOVEMBER, 1980. |
| ST. JOE ZINC<br>G.F. WEATON<br>1<br>RETROFIT 60.0 MW (GROSS)<br>60.0 MW (ESC)<br>COAL<br>2.00 %S BITUMINOUS<br>CITRATE<br>BUREAU OF MINES<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 11/79 | G.F. WEATON 1, OWNED BY ST. JOE ZINC, IS A COAL (3.0% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN MONACA, PENNSYLVANIA. THE BUREAU OF MINES RETROFITTED A PROTOTYPE CITRATE FGD SYSTEM ON THIS UNIT, WHICH PROVIDES POWER FOR THE LOCAL UTILITY GRID. ONE VENTURI SCRUBBER/ABSORBER TRAIN FOLLOWS A COLD SIDE ESP. TWO CHEVRON MIST ELIMINATORS ARE FOLLOWED BY A COMBINATION OF INDIRECT HOT AIR AND DIRECT COMBUSTION REHEATERS, AND A 102 FOOT FIBERGLASS LINED SCRUBBER STACK. THE SYSTEM SO2 REMOVAL EFFICIENCY WILL BE OVER 90%. THE WATER LOOP IS CLOSED LOOP MODE. THE FGD SYSTEM COMMENCED OPERATION IN NOVEMBER OF 1979. |
| TAMPA ELECTRIC<br>BIG BEND<br>4<br>NEW 475.0 MW (GROSS)<br>475.0 MW (ESC)<br>COAL<br>2.50 %S<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 3/85 | UNIT 4 AT TAMPA ELECTRIC'S BIG BEND STATION IS A PLANNED DRY BOTTOM PULVERIZED COAL (2.5% S, 10,300 BTU/LB) FIRED UNIT TO BE LOCATED IN TAMPA, FLORIDA. THE FGD PROCESS HAS NOT YET BEEN CHOSEN. AN ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM, WHICH WILL REMOVE 90% OF THE FLUE GAS SO2, WILL INCLUDE AN INDIRECT HOT AIR REHEATER LEADING TO A 490 FOOT CONCRETE LINED STACK. |
| TENNESSEE VALLEY AUTHORITY<br>JOHNSONVILLE<br>1-10<br>RETROFIT 1450.0 MW (GROSS)<br>600.0 MW (ESC)<br>COAL<br>3.10 %S<br>MAGNESIUM OXIDE<br>RILEY ENVIRONEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 12/81 | UNITS 1 THROUGH 10 AT JOHNSONVILLE STATION OF TVA ARE COAL (2.6% S, 10,750 BTU/LB) FIRED BOILERS LOCATED IN NEW JOHNSONVILLE, TENNESSEE. UNITED ENGINEERS HAS BEEN AWARDED A CONTRACT TO PROVIDE ENGINEERING ASSISTANCE TO TVA FOR A 90% EFFICIENT MAGNESIUM OXIDE FGD SYSTEM TO BE RETROFITTED ON THESE UNITS. SULFURIC ACID WILL BE PRODUCED AS A BYPRODUCT FROM THIS SYSTEM, WHICH WILL FEATURE FOUR VENTURI SCRUBBER/ABSORBER TRAINS (ONE SPARE), 60% BYPASS REHEAT, AND A 600 FOOT STACK. START UP IS EXPECTED IN 1981. |
| TENNESSEE VALLEY AUTHORITY<br>PARADISE<br>1<br>RETROFIT 704.0 MW (GROSS)<br>704.0 MW (ESC)<br>COAL<br>4.20 %S<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 3/82 | PARADISE 1 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILLABLE GRADE SLUDGE. OPERATIONS SHOULD START IN MARCH, 1982. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| TENNESSEE VALLEY AUTHORITY<br>PARADISE<br>2<br>RETROFIT 704.0 MW (GROSS)<br>704.0 MW (ESC)<br>COAL<br>4.20 %S<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 6/82 | PARADISE 2 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILLABLE GRADE SLUDGE. OPERATIONS SHOULD START IN JUNE, 1982. |
| TENNESSEE VALLEY AUTHORITY<br>SHAWNEE<br>10A<br>RETROFIT 10.0 MW (GROSS)<br>10.0 MW (ESC)<br>COAL<br>2.90 %S BITUMINOUS<br>LIME/LIMESTONE<br>AIR CORRECTION DIVISION, UOP<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 4/72 | SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10A IS A RETROFIT PROTOTYPE LIME/LIMESTONE TCA SYSTEM SUPPLIED BY THE AIR CORRECTION DIVISION, UOP. THE SYSTEM UTILIZES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1972. |
| TENNESSEE VALLEY AUTHORITY<br>SHAWNEE<br>10B<br>RETROFIT 10.0 MW (GROSS)<br>10.0 MW (ESC)<br>COAL<br>2.90 %S BITUMINOUS<br>LIME/LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 4/72 | SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10B IS A RETROFIT PROTOTYPE LIME/LIMESTONE VENTURI SCRUBBER/SPRAY TOWER ABSORBER SUPPLIED BY CHEMICO. THE SYSTEM, OPERATIONAL SINCE APRIL, 1972, INCLUDES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER. |
| TENNESSEE VALLEY AUTHORITY<br>WIDOWS CREEK<br>7<br>RETROFIT 575.0 MW (GROSS)<br>575.0 MW (ESC)<br>COAL<br>3.70 %S BITUMINOUS<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 9/81 | WIDOWS CREEK 7 IS A PULVERIZED BITUMINOUS COAL (3.7% S, 11,100 BTU/LB) FIRED BOILER OF TVA LOCATED IN BRIDGEPORT, ALABAMA. COMBUSTION ENGINEERING IS PRESENTLY RETROFITTING A LIMESTONE VENTRI ROD SCRUBBER/SPRAY TOWER ABSORBER FGD SYSTEM ON THIS UNIT. AN ESP WILL PRECEDE THE SCRUBBING TRAIN, AND A COMBINATION OF A BULK ENTRAINMENT SEPARATOR, TWO CHEVRON MIST ELIMINATORS AND A FINNED TUBE REHEATER FOLLOW THE SYSTEM. THE SCRUBBER SLUDGE WILL BE DISPOSED IN A SLUDGE POND. CONSTRUCTION BEGAN IN SEPTEMBER, 1978. AND START UP IS EXPECTED IN SEPTEMBER, 1981. |
| TENNESSEE VALLEY AUTHORITY<br>WIDOWS CREEK<br>8<br>RETROFIT 550.0 MW (GROSS)<br>550.0 MW (ESC)<br>COAL<br>3.70 %S<br>LIMESTONE<br>TENNESSEE VALLEY AUTHORITY<br>ENERGY CONSUMPTION: 4.7%<br>STATUS 1 STARTUP 5/77 | WIDOWS CREEK 8 OF TVA IS A BALANCED DRAFT, TANGENTIALLY FIRED COAL (4.3% S, 10,000 BTU/LB) BOILER IN BRIDGEPORT, ALABAMA. TVA RETROFITTED THIS UNIT WITH A LIMESTONE FGD SYSTEM (80% DESIGN SO2 REMOVAL EFFICIENCY) WHICH BEGAN OPERATIONS IN MAY, 1977. AN ESP PRECEDES FOUR VARIABLE THROAT VENTURI SCRUBBER/MULTIGRID TOWER ABSORBER TRAINS (ONE OF THE TOWERS IS PACKED). ONE VERTICAL CHEVRON/TRAIN AND AN INDIRECT HOT AIR REHEATER ARE INCLUDED IN THE SYSTEM. SLUDGE FROM THE FGD SYSTEM IS PONDED. |
| TEXAS MUNICIPAL POWER AGENCY<br>GIBBONS CREEK<br>1<br>NEW 400.0 MW (GROSS)<br>400.0 MW (ESC)<br>COAL<br>1.06 %S LIGNITE<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 1/82 | GIBBONS CREEK 1 OF THE TEXAS MUNICIPAL POWER AGENCY IS A DRY BOTTOM PULVERIZED LIGNITE (1.06% S, 4860 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN CARLOS, TEXAS. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY THREE 50% CAPACITY LIMESTONE SPRAY TOWERS. A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR THE FGD SYSTEM, WHICH INCLUDES A CHEVRON MIST ELIMINATOR AND A STEAM COIL REHEATER. CLEANED FLUE GAS WILL BE DISCHARGED THROUGH A 465 FOOT ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS STRIP MINE LANDFILL. START UP IS EXPECTED IN JANUARY, 1982. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| TEXAS POWER & LIGHT<br>SANDOW<br>4<br>NEW 545.0 MW (GROSS)<br>382.0 MW (ESC)<br>COAL<br>1.60 %S LIGNITE<br>LIMESTONE<br>COMBUSTION ENGINEERING<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 7/80 | SANDOW 4 IS A PULVERIZED 1.6% SULFUR LIGNITE FIRED BOILER OF TEXAS POWER AND LIGHT UNDER CONSTRUCTION IN ROCKDALE, TEXAS. COMBUSTION ENGINEERING IS SUPPLYING THREE LIMESTONE SPRAY TOWERS FOR THIS UNIT. A COLD SIDE ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. A 30% BYPASS REHEAT WILL BE USED, AND THE OVERALL SO2 REMOVAL EFFICIENCY WILL BE 75%. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE SLUDGE WILL BE PONDED. START UP IS EXPECTED IN JULY, 1980. |
| TEXAS POWER & LIGHT<br>TWIN OAKS<br>1<br>NEW 750.0 MW (GROSS)<br>750.0 MW (ESC)<br>COAL<br>.70 %S LIGNITE<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 8/84 | TWIN OAKS 1 IS A 0.75% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST OF 1984. |
| TEXAS POWER & LIGHT<br>TWIN OAKS<br>2<br>NEW 750.0 MW (GROSS)<br>750.0 MW (ESC)<br>COAL<br>.70 %S LIGNITE<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 8/85 | TWIN OAKS 2 IS A 0.75% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST OF 1985. |
| TEXAS UTILITIES<br>FOREST GROVE<br>1<br>NEW 750.0 MW (GROSS)<br>750.0 MW (ESC)<br>COAL<br>.80 %S LIGNITE<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 5 STARTUP 0/81 | TEXAS UTILITIES IS PLANNING A LIGNITE (0.8% S, 7000 BTU/LB) FIRED BOILER, FOREST GROVE 1, WHICH WILL BE LOCATED IN ATHENS, TEXAS. THE UTILITY IS PRESENTLY REQUESTING BIDS ON AN FGD SYSTEM FOR THIS UNIT. TWO ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL, AND NO STACK GAS REHEAT IS PLANNED. START UP IS EXPECTED IN LATE 1981. |
| TEXAS UTILITIES<br>MARTIN LAKE<br>1<br>NEW 793.0 MW (GROSS)<br>595.0 MW (ESC)<br>COAL<br>.90 %S LIGNITE<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 1.3%<br>STATUS 1 STARTUP 4/77 | TEXAS UTILITIES' MARTIN LAKE 1 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN APRIL, 1977. |
| TEXAS UTILITIES<br>MARTIN LAKE<br>2<br>NEW 793.0 MW (GROSS)<br>595.0 MW (ESC)<br>COAL<br>.90 %S LIGNITE<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 1.3%<br>STATUS 1 STARTUP 5/78 | TEXAS UTILITIES' MARTIN LAKE 2 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN MAY, 1978. |

## SECTION 2
## STATUS OF FGD SYSTEMS

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| TEXAS UTILITIES<br>MARTIN LAKE<br>3<br>NEW 793.0 MW (GROSS)<br>595.0 MW (ESC)<br>COAL<br>.90 %S LIGNITE<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: 1.3%<br>STATUS 1 STARTUP 2/79 | TEXAS UTILITIES' MARTIN LAKE 3 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN FEBRUARY, 1979. |
| TEXAS UTILITIES<br>MARTIN LAKE<br>4<br>NEW 750.0 MW (GROSS)<br>750.0 MW (ESC)<br>COAL<br>.90 %S LIGNITE<br>LIMESTONE<br>RESEARCH COTTRELL<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 0/85 | MARTIN LAKE 4 OF TEXAS UTILITIES IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN TATUM, TEXAS. A CONTRACT FOR A LIMESTONE FGD SYSTEM FOR THIS UNIT HAS BEEN AWARDED TO RESEARCH COTTRELL. CONSTRUCTION HAS NOT YET BEGUN ON THE FGD SYSTEM, FGD START UP IS EXPECTED IN 1985 OR 1986. |
| TEXAS UTILITIES<br>MILL CREEK<br>1<br>NEW 750.0 MW (GROSS)<br>750.0 MW (ESC)<br>COAL<br>***** %S LIGNITE<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/85 | MILL CREEK 1 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL. START UP IS EXPECTED IN 1985. |
| TEXAS UTILITIES<br>MILL CREEK<br>2<br>NEW 750.0 MW (GROSS)<br>750.0 MW (ESC)<br>COAL<br>***** %S LIGNITE<br>PROCESS NOT SELECTED<br>VENDOR NOT SELECTED<br>ENERGY CONSUMPTION: ****%<br>STATUS 6 STARTUP 0/86 | MILL CREEK 2 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL. START UP IS EXPECTED IN 1986. |
| TEXAS UTILITIES<br>MONTICELLO<br>3<br>NEW 800.0 MW (GROSS)<br>800.0 MW (ESC)<br>COAL<br>1.50 %S LIGNITE<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 5/78 | MONTICELLO 3 OF TEXAS UTILITIES IS A LIGNITE (1.5% S, 7000 BTU/LB) FIRED UNIT IN MT. PLEASANT, TEXAS. THIS UNIT'S EMISSION CONTROL SYSTEM CONSISTS OF TWO COLD SIDE ESP'S FOLLOWED BY THREE CHEMICO LIMESTONE SPRAY TOWERS (74% DESIGN SO2 REMOVAL EFFICIENCY), ONE HORIZONTAL CHEVRON MIST ELIMINATOR/MODULE, AND AN INDIRECT HOT AIR REHEATER. THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS DISPOSED IN AN ON SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE MAY OF 1978. |
| TUCSON ELECTRIC POWER<br>SPRINGERVILLE<br>1<br>NEW 370.0 MW (GROSS)<br>370.0 MW (ESC)<br>COAL<br>***** %S SUBBITUMINOUS<br>LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 6/85 | TUCSON GAS AND ELECTRIC WILL BE BUILDING TWO NEW UNITS IN SPRINGERVILLE, COLORADO, SPRINGERVILLE 1 AND 2. THE UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.53-0.69% S AND 8500-8900 BTU/LB). A CONTRACT HAS BEEN AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM TO CONTROL PARTICULATE MATTER AND SO2 EMISSIONS. THE SYSTEM WILL BE DESIGNED TO ACCOMODATE A REHEATER (SHOULD ONE BE REQUIRED) AND WILL OPERATE IN A CLOSED WATER LOOP. CLEANED FLUE GAS WILL EXIT THE SYSTEM VIA A 500 FOOT CONCRETE STACK. OPERATIONS ARE SCHEDULED TO BEGIN IN 1985. |

## SECTION 2
## STATUS OF FGD SYSTEMS.

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| TUCSON ELECTRIC POWER<br>SPRINGERVILLE<br>2<br>NEW 370.0 MW (GROSS)<br>370.0 MW (ESC)<br>COAL<br>***** %S SUBBITUMINOUS<br>LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 1/87 | TUCSON GAS AND ELECTRIC WILL BE BUILDING TWO NEW UNITS IN SPRINGERVILLE, COLORADO, SPRINGERVILLE 1 AND 2. THE UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.53-0.69% S AND 8500-8900 BTU/LB). A CONTRACT HAS BEEN AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM TO CONTROL PARTICULATE MATTER AND SO2 EMISSIONS. THE SYSTEM WILL BE DESIGNED TO ACCOMODATE A REHEATER (SHOULD ONE BE REQUIRED) AND WILL OPERATE IN A CLOSED WATER LOOP. CLEANED FLUE GAS WILL EXIT THE SYSTEM VIA A 500 FOOT CONCRETE STACK. OPERATIONS ARE SCHEDULED TO BEGIN IN 1987. |
| UNITED POWER ASSOCIATION<br>STANTON<br>2<br>NEW 50.0 MW (GROSS)<br>50.0 MW (ESC)<br>COAL<br>.77 %S LIGNITE<br>LIME/SPRAY DRYING<br>KOMLINE & SANDERSON<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 1/82 | THE UNITED POWER ASSOCIATION HAS PLANS FOR A PULVERIZED COAL (0.77% S, 7000 BTU/LB) FIRED UNIT, STANTON 2, TO BE LOCATED IN STANTON, NORTH DAKOTA. A CONTRACT HAS BEEN AWARDED TO KOMLINE AND SANDERSON FOR A LIME SPRAY TOWER. A FABRIC FILTER SUPPLIED BY RESEARCH COTTRELL WILL BE DESIGNED TO REMOVE 99% OF THE PARTICULATE. THE SYSTEM WILL OPERATE IN AN OPEN LOOP MODE WITH SLUDGE DISPOSAL TO BE IN A CLAY LINED SETTLING POND. OPERATIONS ARE SCHEDULED TO COMMENCE IN JANUARY, 1982. |
| UTAH POWER & LIGHT<br>HUNTER<br>1<br>NEW 400.0 MW (GROSS)<br>360.0 MW (ESC)<br>COAL<br>.55 %S BITUMINOUS<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 1 STARTUP 5/79 | HUNTER 1 OF UTAH POWER AND LIGHT IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT IN CASTLEDALE, UTAH. CHEMICO SUPPLIED A PEBBLE LIME WET SCRUBBING SYSTEM WHICH BECAME OPERATIONAL IN MAY, 1979. THE SCRUBBING SYSTEM IS DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO2 REMOVAL EFFICIENCY OF 80%. PRIMARY PARTICULATE CONTROL IS PROVIDED BY AN UPSTREAM ESP, AND STACK GAS REHEAT IS PROVIDED BY BYPASS. THE SLUDGE IS FLYASH STABILIZED AND DISPOSED ON-SITE. |
| UTAH POWER & LIGHT<br>HUNTER<br>2<br>NEW 400.0 MW (GROSS)<br>360.0 MW (ESC)<br>COAL<br>.55 %S<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 2 STARTUP 6/80 | UTAH POWER AND LIGHT'S HUNTER 2 IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN CASTLEDALE, UTAH. CHEMICO IS SUPPLYING A PEBBLE LIME WET SCRUBBING SYSTEM DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO2 REMOVAL EFFICIENCY OF 80%. AN UPSTREAM ESP PROVIDES PRIMARY PARTICULATE CONTROL, AND A BYPASS SYSTEM PROVIDES STACK GAS REHEAT. THE SLUDGE WILL BE FLYASH STABILIZED AND DISPOSED ON-SITE. START UP OF BOTH THE BOILER AND FGD SYSTEM IS EXPECTED IN JUNE, 1980. |
| UTAH POWER & LIGHT<br>HUNTER<br>3<br>NEW 400.0 MW (GROSS)<br>400.0 MW (ESC)<br>COAL<br>.55 %S BITUMINOUS<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 0/83 | UTAH POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, HUNTER 3 AND 4, TO BE CONSTRUCTED IN CASTLEDALE, UTAH. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIME, NONREGENERABLE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNITS (0.55% S, 12,500 BTU/LB) ARE TO BEGIN OPERATIONS IN 1983 AND 1985, RESPECTIVELY. |
| UTAH POWER & LIGHT<br>HUNTER<br>4<br>NEW 400.0 MW (GROSS)<br>400.0 MW (ESC)<br>COAL<br>.55 %S BITUMINOUS<br>LIMESTONE<br>CHEMICO<br>ENERGY CONSUMPTION: ****%<br>STATUS 3 STARTUP 0/85 | UTAH POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, HUNTER 3 AND 4, TO BE CONSTRUCTED IN CASTLEDALE, UTAH. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIME, NONREGENERABLE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNITS (0.55% S, 12,500 BTU/LB) ARE TO BEGIN OPERATIONS IN 1983 AND 1985, RESPECTIVELY. |

| UNIT IDENTIFICATION | ABSTRACT |
|---|---|
| UTAH POWER & LIGHT<br>HUNTINGTON<br>1<br>NEW 430.0 MW (GROSS)<br>366.0 MW (ESC)<br>COAL<br>.55 %S BITUMINOUS<br>LIME<br>CHEMICO<br>ENERGY CONSUMPTION: 1.6%<br>STATUS 1 STARTUP 5/78 | HUNTINGTON 1 OF UTAH POWER IS A TANGENTIALLY FIRED PULVERIZED COAL (0.55% S, 12,500 BTU/LB) BOILER IN PRICE, UTAH. A COLD SIDE ESP TREATS 1,742,000 ACFM OF FLUE GAS AND IS FOLLOWED BY A CHEMICO LIME FGD SYSTEM CONSISTING OF FOUR SPRAY TOWERS (80% DESIGN EFFICIENCY). ONE FOUR PASS CHEVRON/MODULE PROVIDES MIST ELIMINATION, AND A COMBINATION OF A STEAM TUBE AND 10-20% BYPASS REHEATERS BOOST THE GAS TEMPERATURE 45-50 DEG F. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE FLYASH STABILIZED SLUDGE IS TRUCKED TO AN ON-SITE LANDFILL. THE SYSTEM INCLUDES A 600 FOOT ACID BRICK LINED STACK, AND HAS BEEN OPERATIONAL SINCE MAY OF 1978. |

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                                    SECTION 3
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
------------------------------------------------------------------------------------------------

 COMPANY NAME                                       ALABAMA ELECTRIC COOP
 PLANT NAME                                         TOMBIGBEE
 UNIT NUMBER                                        2
 CITY                                               LEROY
 STATE                                              ALABAMA
 GROSS UNIT GENERATING CAPACITY - MW                  255.0
 NET UNIT GENERATING CAPACITY W/FGD - MW              235.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    179.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                      26749.        ( 11500 BTU/LB)
     AVERAGE ASH CONTENT - %                            14.00
     AVERAGE MOISTURE CONTENT - %                        7.00
     AVERAGE SULFUR CONTENT - %                          1.15
     AVERAGE CHLORIDE CONTENT - %                         .04

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   LIMESTONE
     SYSTEM SUPPLIER                                PEABODY PROCESS SYSTEMS
     NEW/RETROFIT                                   NEW
     ENERGY CONSUMPTION - %                              3.1
     INITIAL START-UP DATE                           9/78
     COMMERCIAL START-UP DATE                        9/78
     SO2 DESIGN REMOVAL EFFICIENCY - %                 85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.30
     ABSORBER SPARE CAPACITY INDEX - %                   .0
     ABSORBER SPARE COMPONENTS INDEX                     .0

 ** WATER LOOP
     TYPE                                           CLOSED
     FRESH MAKE-UP WATER - LITER/S                      8.8        (  140 GPM)

 ** DISPOSAL
     TYPE                                           LINED POND


------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  A                       35.8                    21.1
       B                       56.7                    33.5
       SYSTEM     90.7         81.5                    48.1                    744    439    357

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         DURING JANUARY UNIT 2 WAS UNAVAILABLE 69 HOURS DUE TO REPAIRS NEEDED ON
                         AN ABRADED EXPANSION JOINT AND A RUPTURED WASTE SLURRY LINE.

 2/80  A                       84.3                    84.3
       B                       74.7                    74.7
       SYSTEM     99.3         99.3                    99.3                    696    696    691

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE UNIT 2 FGD SYSTEM OPERATED ALL BUT 5 HOURS DURING FEBRUARY, IN WHICH
                         TIME THE BOILER WAS BEING BROUGHT ON-LINE.

 3/80  A                       81.6                    75.0
       B                       79.4                    73.0
       SYSTEM    100.0         97.8                    89.9                    744    684    669
```

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ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)


------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

      ** PROBLEMS/SOLUTIONS/COMMENTS

                            DURING MARCH THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.
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                                 SECTION 3
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
------------------------------------------------------------------------------------------------------

 COMPANY NAME                                         ALABAMA ELECTRIC COOP
 PLANT NAME                                           TOMBIGBEE
 UNIT NUMBER                                          3
 CITY                                                 LEROY
 STATE                                                ALABAMA
 GROSS UNIT GENERATING CAPACITY - MW                    255.0
 NET UNIT GENERATING CAPACITY W/FGD - MW                235.0
 EQUIVALENT SCRUBBED CAPACITY - MW                      179.0

 ** FUEL DATA
     FUEL TYPE                                        COAL
     FUEL GRADE                                       BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                        26749.        ( 11500 BTU/LB)
     AVERAGE ASH CONTENT - %                              14.00
     AVERAGE MOISTURE CONTENT - %                          7.00
     AVERAGE SULFUR CONTENT - %                            1.15
     AVERAGE CHLORIDE CONTENT - %                           .04

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                             WET SCRUBBING
     PROCESS TYPE                                     LIMESTONE
     SYSTEM SUPPLIER                                  PEABODY PROCESS SYSTEMS
     NEW/RETROFIT                                     NEW
     ENERGY CONSUMPTION - %                                3.1
     INITIAL START-UP DATE                             6/79
     COMMERCIAL START-UP DATE                          6/79
     SO2 DESIGN REMOVAL EFFICIENCY - %                    85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %            99.30
     ABSORBER SPARE CAPACITY INDEX - %                      .0
     ABSORBER SPARE COMPONENTS INDEX                        .0

 ** WATER LOOP
     TYPE                                             CLOSED
     FRESH MAKE-UP WATER - LITER/S                         8.8        (  140 GPM)

 ** DISPOSAL
     TYPE                                             LINED POND


-----------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  A                       69.2                    30.5
       B                       45.4                    20.0
       SYSTEM      100.0       97.9                    43.1                    744   328    321

       ** PROBLEMS/SOLUTIONS/COMMENTS

                       DURING JANUARY UNIT 3 WAS AVAILABLE THE ENTIRE MONTH.

 2/80  A                       33.3                     1.1
       B                      100.0                     3.4
       SYSTEM      100.0      100.0                     3.4                    696    24     24

       ** PROBLEMS/SOLUTIONS/COMMENTS

                       DURING FEBRUARY THE UNIT 3 BOILER AND FGD SYSTEM OPERATED ONLY 24 HOURS.

 3/80  A                                                 .0
       B                                                 .0
       SYSTEM      100.0                                 .0                    744     0      0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                       DURING MARCH THE UNIT 3 GENERATOR WAS KEPT OUT OF SERVICE.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | |
|---|---|
| COMPANY NAME | ALLEGHENY POWER SYSTEM |
| PLANT NAME | PLEASANTS |
| UNIT NUMBER | 1 |
| CITY | BELMONT |
| STATE | WEST VIRGINIA |
| GROSS UNIT GENERATING CAPACITY - MW | 625.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 625.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 519.0 |

** FUEL DATA

| | | |
|---|---|---|
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 27912. | ( 12000 BTU/LB) |
| AVERAGE ASH CONTENT - % | ******** | |
| AVERAGE MOISTURE CONTENT - % | 15.00 | |
| AVERAGE SULFUR CONTENT - % | 3.70 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |

** FGD SYSTEM

| | |
|---|---|
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | LIME |
| SYSTEM SUPPLIER | BABCOCK & WILCOX |
| NEW/RETROFIT | NEW |
| ENERGY CONSUMPTION - % | ******* |
| INITIAL START-UP DATE | 3/79 |
| COMMERCIAL START-UP DATE | **/** |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 90.00 |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.55 |
| ABSORBER SPARE COMPONENTS INDEX | .0 |

** WATER LOOP

| | | |
|---|---|---|
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL | | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 690 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE ON THE OPERATIONS AT PLEASANTS 1 FOR THE FIRST QUARTER 1980.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----------------------------------------------------------------------------------------------------

COMPANY NAME                                        ARIZONA ELECTRIC POWER COOP
PLANT NAME                                          APACHE
UNIT NUMBER                                         2
CITY                                                COCHISE
STATE                                               ARIZONA
GROSS UNIT GENERATING CAPACITY - MW                   195.0
NET UNIT GENERATING CAPACITY W/FGD - MW               175.0
EQUIVALENT SCRUBBED CAPACITY - MW                     195.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       23260.        ( 10000 BTU/LB)
    AVERAGE ASH CONTENT - %                             15.00
    AVERAGE MOISTURE CONTENT - %                         9.00
    AVERAGE SULFUR CONTENT - %                            .55
    AVERAGE CHLORIDE CONTENT - %                    ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    LIMESTONE
    SYSTEM SUPPLIER                                 RESEARCH COTTRELL
    NEW/RETROFIT                                    NEW
    ENERGY CONSUMPTION - %                              4.1
    INITIAL START-UP DATE                            8/78
    COMMERCIAL START-UP DATE                         1/79
    SO2 DESIGN REMOVAL EFFICIENCY - %                  85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.50
    ABSORBER SPARE CAPACITY INDEX - %                    .0
    ABSORBER SPARE COMPONENTS INDEX                      .0

** WATER LOOP
    TYPE                                            OPEN
    FRESH MAKE-UP WATER - LITER/S                     115.9        ( 1840 GPM)

** DISPOSAL
    TYPE                                            POND


---------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM     90.9         58.3        88.8         57.3   97.40         744   731    426

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          DURING JANUARY SOME OUTAGE TIME WAS DUE TO A PUMP MALFUNCTION.

                          OUTAGE TIME WAS ALSO CAUSED BY A BROKEN FEED BELT TO THE LIMESTONE BALL
                          MILL.

 2/80  SYSTEM     92.8         96.7        92.8         92.8   97.40         696   668    646

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          DURING FEBRUARY OUTAGE TIME WAS DUE TO A PRECIPITATOR FAILURE.

                          FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.

 3/80  SYSTEM     99.0         99.0        99.0         99.0                 744   744    738

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          SOME OF THE OUTAGE TIME DURING MARCH OCCURRED BECAUSE OF PUMP FAILURE.

                          OTHER OUTAGE TIME WAS CAUSED BY STICKING VALVES AND LIMESTONE FEED-BELT
                          PROBLEMS.
```

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                                     SECTION 3
              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
-----------------------------------------------------------------------------------------------------

COMPANY NAME                                    ARIZONA ELECTRIC POWER COOP
PLANT NAME                                      APACHE
UNIT NUMBER                                     3
CITY                                            COCHISE
STATE                                           ARIZONA
GROSS UNIT GENERATING CAPACITY - MW               195.0
NET UNIT GENERATING CAPACITY W/FGD - MW           175.0
EQUIVALENT SCRUBBED CAPACITY - MW                 195.0

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                   23260.        ( 10000 BTU/LB)
    AVERAGE ASH CONTENT - %                         15.00
    AVERAGE MOISTURE CONTENT - %                     9.00
    AVERAGE SULFUR CONTENT - %                        .55
    AVERAGE CHLORIDE CONTENT - %                ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                        WET SCRUBBING
    PROCESS TYPE                                LIMESTONE
    SYSTEM SUPPLIER                             RESEARCH COTTRELL
    NEW/RETROFIT                                NEW
    ENERGY CONSUMPTION - %                          4.1
    INITIAL START-UP DATE                        6/79
    COMMERCIAL START-UP DATE                     4/79
    SO2 DESIGN REMOVAL EFFICIENCY - %              85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.50
    ABSORBER SPARE CAPACITY INDEX - %                 .0
    ABSORBER SPARE COMPONENTS INDEX                   .0

** WATER LOOP
    TYPE                                        OPEN
    FRESH MAKE-UP WATER - LITER/S                 340.2        ( 5400 GPM)

** DISPOSAL
    TYPE                                        POND


-----------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER  FGD    CAP.
                                                                SO2   PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ----- ----- ------

 1/80  SYSTEM     91.7         91.7        91.7        91.7    97.40             744   744   682

      ** PROBLEMS/SOLUTIONS/COMMENTS

                          DURING JANUARY SOME OUTAGE TIME WAS DUE TO A PUMP MALFUNCTION.

                          OUTAGE TIME WAS ALSO CAUSED BY A BROKEN FEED BELT TO THE LIMESTONE BALL
                          MILL.
 2/80  SYSTEM     95.6         74.1        96.0        71.4    97.40             696   671   497

      ** PROBLEMS/SOLUTIONS/COMMENTS

                          DURING FEBRUARY OUTAGE TIME WAS DUE TO A PRECIPITATOR FAILURE.

                          FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.

 3/80  SYSTEM     91.0         91.0        91.0        91.0                      744   744   677

      ** PROBLEMS/SOLUTIONS/COMMENTS

                          SOME OF THE OUTAGE TIME DURING MARCH OCCURRED BECAUSE OF PUMP FAILURE.

                          OTHER OUTAGE TIME WAS CAUSED BY STICKING VALVES AND LIMESTONE FEED-BELT
                          PROBLEMS.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | ARIZONA PUBLIC SERVICE | |
| PLANT NAME | CHOLLA | |
| UNIT NUMBER | 1 | |
| CITY | JOSEPH CITY | |
| STATE | ARIZONA | |
| GROSS UNIT GENERATING CAPACITY - MW | 119.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 115.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 119.0 | |
| **** FUEL DATA** | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 23609. | ( 10150 BTU/LB) |
| AVERAGE ASH CONTENT - % | 13.50 | |
| AVERAGE MOISTURE CONTENT - % | 15.00 | |
| AVERAGE SULFUR CONTENT - % | .50 | |
| AVERAGE CHLORIDE CONTENT - % | .02 | |
| **** FGD SYSTEM** | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | RESEARCH COTTRELL | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 3.4 | |
| INITIAL START-UP DATE | 10/73 | |
| COMMERCIAL START-UP DATE | 12/73 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 92.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 80.00 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| **** WATER LOOP** | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 7.6 | ( 120 GPM) |
| **** DISPOSAL** | | |
| TYPE | POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/79 | A | | 77.0 | | 77.0 | | | | | | |
| | B | | 98.0 | | 98.0 | | | | | | |
| | SYSTEM | | 87.5 | | 87.5 | | | 720 | 720 | 632 | |
| 12/79 | A | | 94.0 | | 94.0 | | | | | | |
| | B | | 87.0 | | 87.0 | | | | | | |
| | SYSTEM | | 90.5 | | 90.5 | | | 744 | 744 | 672 | |
| 1/80 | A | | 95.0 | | 95.0 | | | | | | |
| | B | | 99.0 | | 99.0 | | | | | | |
| | SYSTEM | | 97.0 | | 97.0 | | | 744 | 744 | 724 | |
| 2/80 | A | | 100.0 | | 100.0 | | | | | | |
| | B | | 99.0 | | 99.0 | | | | | | |
| | SYSTEM | | 99.5 | | 99.5 | | | 696 | 696 | 694 | |
| 3/80 | A | | 99.0 | | 99.0 | | | | | | |
| | B | | 93.0 | | 93.0 | | | | | | |
| | SYSTEM | | 96.0 | | 96.0 | | | 744 | 744 | 715 | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO FORCED OUTAGES WERE REPORTED BY THE UTILITY FOR THE FIVE MONTH PERIOD. SOME SCHEDULED OUTAGE TIME WAS REQUIRED FOR REPAIR OF THE REHEATER DUCTWORK.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | ARIZONA PUBLIC SERVICE | |
| PLANT NAME | CHOLLA | |
| UNIT NUMBER | 2 | |
| CITY | JOSEPH CITY | |
| STATE | ARIZONA | |
| GROSS UNIT GENERATING CAPACITY - MW | 350.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 250.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 350.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 23609. | ( 10150 BTU/LB) |
| AVERAGE ASH CONTENT - % | 13.50 | |
| AVERAGE MOISTURE CONTENT - % | 15.00 | |
| AVERAGE SULFUR CONTENT - % | .50 | |
| AVERAGE CHLORIDE CONTENT - % | .02 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | RESEARCH COTTRELL | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 4/78 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 75.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.70 | |
| ABSORBER SPARE CAPACITY INDEX - % | 33.0 | |
| ABSORBER SPARE COMPONENTS INDEX | 1.0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 7.6 | ( 120 GPM) |
| ** DISPOSAL | | |
| TYPE | POND | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION IS AVAILABLE AS OF YET WITH RESPECT TO THE CHOLLA 2 FGD OPERATIONS.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

---

| | |
|---|---|
| COMPANY NAME | ARIZONA PUBLIC SERVICE |
| PLANT NAME | FOUR CORNERS |
| UNIT NUMBER | 1 |
| CITY | FARMINGTON |
| STATE | NEW MEXICO |
| GROSS UNIT GENERATING CAPACITY - MW | 175.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 175.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 175.0 |

** FUEL DATA

| | | |
|---|---|---|
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 20004. | ( 8600 BTU/LB) |
| AVERAGE ASH CONTENT - % | 22.90 | |
| AVERAGE MOISTURE CONTENT - % | 12.30 | |
| AVERAGE SULFUR CONTENT - % | .75 | |
| AVERAGE CHLORIDE CONTENT - % | .07 | |

** FGD SYSTEM

| | |
|---|---|
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | LIME/ALKALINE FLYASH |
| SYSTEM SUPPLIER | CHEMICO |
| NEW/RETROFIT | RETROFIT |
| ENERGY CONSUMPTION - % | ******* |
| INITIAL START-UP DATE | 11/79 |
| COMMERCIAL START-UP DATE | **/** |
| SO2 DESIGN REMOVAL EFFICIENCY - % | ******** |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 |
| ABSORBER SPARE COMPONENTS INDEX | 1.0 |

---

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/79 | SYSTEM | | | | | | | 720 | | | |
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | |
|---|---|
| COMPANY NAME | ARIZONA PUBLIC SERVICE |
| PLANT NAME | FOUR CORNERS |
| UNIT NUMBER | 2 |
| CITY | FARMINGTON |
| STATE | NEW MEXICO |
| GROSS UNIT GENERATING CAPACITY - MW | 175.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 175.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 175.0 |
| ** FUEL DATA | |
| FUEL TYPE | COAL |
| FUEL GRADE | SUBBITUMINOUS |
| AVERAGE HEAT CONTENT - J/G | 20004. ( 8600 BTU/LB) |
| AVERAGE ASH CONTENT - % | 22.00 |
| AVERAGE MOISTURE CONTENT - % | 12.30 |
| AVERAGE SULFUR CONTENT - % | .75 |
| AVERAGE CHLORIDE CONTENT - % | .07 |
| ** FGD SYSTEM | |
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | LIME/ALKALINE FLYASH |
| SYSTEM SUPPLIER | CHEMICO |
| NEW/RETROFIT | RETROFIT |
| ENERGY CONSUMPTION - % | ******* |
| INITIAL START-UP DATE | 11/79 |
| COMMERCIAL START-UP DATE | **/** |
| SO2 DESIGN REMOVAL EFFICIENCY - % | ******** |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 |
| ABSORBER SPARE COMPONENTS INDEX | 1.0 |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/79 | SYSTEM | | | | | | | 720 | | | |
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

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EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980

                                    SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
----------------------------------------------------------------------------------------------------

 COMPANY NAME                                        ARIZONA PUBLIC SERVICE
 PLANT NAME                                          FOUR CORNERS
 UNIT NUMBER                                         3
 CITY                                                FARMINGTON
 STATE                                               NEW MEXICO
 GROSS UNIT GENERATING CAPACITY - MW                   229.0
 NET UNIT GENERATING CAPACITY W/FGD - MW               229.0
 EQUIVALENT SCRUBBED CAPACITY - MW                     229.0

 ** FUEL DATA
    FUEL TYPE                                        COAL
    FUEL GRADE                                       SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                        20004.        ( 8600 BTU/LB)
    AVERAGE ASH CONTENT - %                             22.00
    AVERAGE MOISTURE CONTENT - %                        12.30
    AVERAGE SULFUR CONTENT - %                            .75
    AVERAGE CHLORIDE CONTENT - %                          .07

 ** FGD SYSTEM
    GENERAL PROCESS TYPE                             WET SCRUBBING
    PROCESS TYPE                                     LIME/ALKALINE FLYASH
    SYSTEM SUPPLIER                                  CHEMICO
    NEW/RETROFIT                                     RETROFIT
    ENERGY CONSUMPTION - %                           *******
    INITIAL START-UP DATE                            11/79
    COMMERCIAL START-UP DATE                         **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                ********
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.00
    ABSORBER SPARE COMPONENTS INDEX                     1.0


---------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- ----------- SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------

11/79  SYSTEM                                                                 720

12/79  SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                      INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

 1/80  SYSTEM                                                                 744

 2/80  SYSTEM                                                                 696

 3/80  SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                      THE UNIT IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.
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                                   SECTION 3
               DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
-----------------------------------------------------------------------------------------------

     COMPANY NAME                                      BIG RIVERS ELECTRIC
     PLANT NAME                                        GREEN
     UNIT NUMBER                                       1
     CITY                                              SEBREE
     STATE                                             KENTUCKY
     GROSS UNIT GENERATING CAPACITY - MW                 242.0
     NET UNIT GENERATING CAPACITY W/FGD - MW             2[illegible].0
     EQUIVALENT SCRUBBED CAPACITY - MW                   242.0

     ** FUEL DATA
         FUEL TYPE                                     COAL
         FUEL GRADE                                    BITUMINOUS
         AVERAGE HEAT CONTENT - J/G                     22678.        (  9750 BTU/LB)
         AVERAGE ASH CONTENT - %                           20.00
         AVERAGE MOISTURE CONTENT - %                      11.00
         AVERAGE SULFUR CONTENT - %                         3.75
         AVERAGE CHLORIDE CONTENT - %                  ********

     ** FGD SYSTEM
         GENERAL PROCESS TYPE                          WET SCRUBBING
         PROCESS TYPE                                  LIME
         SYSTEM SUPPLIER                               AMERICAN AIR FILTER
         NEW/RETROFIT                                  NEW
         ENERGY CONSUMPTION - %                        *******
         INITIAL START-UP DATE                         12/79
         COMMERCIAL START-UP DATE                      12/79
         SO2 DESIGN REMOVAL EFFICIENCY - %                 90.00
         PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.00
         ABSORBER SPARE COMPONENTS INDEX                    1.0

     ** WATER LOOP
         TYPE                                          CLOSED
         FRESH MAKE-UP WATER - LITER/S                 *******         (***** GPM)

     ** TREATMENT
         TYPE                                          POZ-O-TEC


-------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ----- ----- ------

 1/80  SYSTEM                                                               744

 2/80  SYSTEM                                                               696

 3/80  SYSTEM                                                               744

        ** PROBLEMS/SOLUTIONS/COMMENTS

                    NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER, 1980.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | CENTRAL ILLINOIS LIGHT | |
| PLANT NAME | DUCK CREEK | |
| UNIT NUMBER | 1 | |
| CITY | CANTON | |
| STATE | ILLINOIS | |
| GROSS UNIT GENERATING CAPACITY - MW | 416.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 378.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 378.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 24423. | ( 10500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 9.12 | |
| AVERAGE MOISTURE CONTENT - % | 19.00 | |
| AVERAGE SULFUR CONTENT - % | 3.30 | |
| AVERAGE CHLORIDE CONTENT - % | .03 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | RILEY STOKER/ENVIRONEERING | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 2.9 | |
| INITIAL START-UP DATE | 7/76 | |
| COMMERCIAL START-UP DATE | 8/78 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 85.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | ******** | |
| ABSORBER SPARE COMPONENTS INDEX | 1.0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 37.9 | ( 600 GPM) |
| ** DISPOSAL | | |
| TYPE | LINED POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | A | 24.8 | 27.0 | 29.8 | 24.8 | | | | | | |
| | B | 58.5 | 63.6 | 65.9 | 58.5 | | | | | | |
| | C | 17.1 | 18.6 | 20.3 | 17.1 | | | | | | |
| | D | 29.2 | 31.9 | 35.4 | 29.3 | | | | | | |
| | SYSTEM | 32.4 | 35.2 | 38.3 | 32.4 | | | 744 | 684 | 241 | |

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME WAS REQUIRED DURING JANUARY FOR RECYCLE TANK COVERING WORK.

THE MIST ELIMINATOR SECTION PLUGGED ALONG WITH THE NOZZLES HINDERING SYSTEM OPERATIONS. THE MIST ELIMINATOR DRAIN LINE WAS MODIFIED ALSO CAUSING OUTAGE TIME.

OTHER PROBLEMS ENCOUNTERED DURING THE MONTH INCLUDED: A PLUGGED LIMESTONE FEEDER, INLET DAMPER PROBLEMS, SLURRY SUPPLY HEADER LEAKS AND STORAGE PUMP DISCHARGE VALVE REPAIRS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | A | 11.8 | 11.8 | 12.5 | 11.8 | | | | | | |
| | B | 72.7 | 72.7 | 73.5 | 72.7 | | | | | | |
| | C | 70.7 | 70.7 | 71.5 | 70.7 | | | | | | |
| | D | 70.2 | 41.2 | 47.8 | 41.2 | | | | | | |
| | SYSTEM | 49.7 | 49.1 | 51.9 | 49.1 | | | 696 | 696 | 342 | |

```
CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)


------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         DURING FEBRUARY SOME OUTAGE TIME WAS DUE TO MODULE CLEANING AND THE
                         CLEANING OF THE MIST ELIMINATOR SECTION.

                         THE INLET DAMPER DRIVE WAS REPLACED DURING THE MONTH.

                         REPAIR OF THE FIBERGLASS ON THE SLURRY RECYCLE LINE HINDERED OPER-
                         ATIONS DURING THIS MONTH.

                         THE RECYCLE DISCHARGE VALVE WAS REPLACED CAUSING SOME DOWN TIME.

 3/80  SYSTEM                                                            744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         NO INFORMATION WAS AVAILABLE FOR THE MONTH OF MARCH.
```

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                                        SECTION 3
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
------------------------------------------------------------------------------------------------

 COMPANY NAME                                        CENTRAL ILLINOIS PUBLIC SERV
 PLANT NAME                                          NEWTON
 UNIT NUMBER                                         1
 CITY                                                NEWTON
 STATE                                               ILLINOIS
 GROSS UNIT GENERATING CAPACITY - MW                   617.0
 NET UNIT GENERATING CAPACITY W/FGD - MW               575.0
 EQUIVALENT SCRUBBED CAPACITY - MW                     617.0

 ** FUEL DATA
     FUEL TYPE                                       COAL
     FUEL GRADE                                      BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                       25353.          ( 10900 BTU/LB)
     AVERAGE ASH CONTENT - %                              4.00
     AVERAGE MOISTURE CONTENT - %                    ********
     AVERAGE SULFUR CONTENT - %                           2.25
     AVERAGE CHLORIDE CONTENT - %                          .20

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                            WET SCRUBBING
     PROCESS TYPE                                    DUAL ALKALI
     SYSTEM SUPPLIER                                 BUELL/ENVIROTECH
     NEW/RETROFIT                                    NEW
     ENERGY CONSUMPTION - %                          *******
     INITIAL START-UP DATE                            9/79
     COMMERCIAL START-UP DATE                        12/79
     SO2 DESIGN REMOVAL EFFICIENCY - %                   95.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %           99.50
     ABSORBER SPARE COMPONENTS INDEX                      1.0

 ** WATER LOOP
     TYPE                                            CLOSED
     FRESH MAKE-UP WATER - LITER/S                   *******         (***** GPM)

 ** TREATMENT
     TYPE                                            POZ-O-TEC


-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  A             68.3        57.1        63.5        55.5
       B             66.4        60.6        64.9        58.9
       C             52.2        48.8        60.5        47.4
       D             21.0        19.1        26.3        18.5
       SYSTEM        52.0        46.4        53.8        45.1                744    723    336

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           DURING JANUARY TESTS WERE CONDUCTED TO CERTIFY THE GAS EMISSIONS MONITOR
                           AT NEWTON.

 2/80  A             61.1        42.4        45.0        42.4
       B             74.4        55.7        57.7        55.7
       C             78.2        58.5        59.1        58.5
       D               .0          .0          .0          .0
       SYSTEM        53.4        39.2        40.4        39.2                696    696    273

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           DURING FEBRUARY THE D MODULE WAS UNAVAILABLE DUE TO THE COLLAPSE OF THE
                           PRECOOLER MIST ELIMINATORS CAUSED BY A TEMPERATURE EXCURSION.

 3/80  A             53.4        52.6        53.1        52.3
       B             47.0        42.3        48.0        42.1
       C             44.5        41.1        46.5        41.0
```

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | .0 | .0 | .0 | .0 | | | | | | |
| | SYSTEM | 36.2 | 34.0 | 36.9 | 33.9 | | | 744 | 740 | 252 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, 1980, THE FOLLOWING PROBLEMS WERE ENCOUNTERED:
THE VALVES AND PIPING IN THE PRECOOLER LOOP EXPERIENCED CORROSION.
THE MIST ELIMINATOR ON THE D MODULE FAILED.
THE FLY ASH SUPPLIES DEPLETED.
RUBBER LINING AND DUCTWORK LINING FAILURES OCCURRED.
BOOSTER FAN EXPANSION JOINT FAILURE OCCURRED.
THE THICKENER EXPERIENCED PLUGGING.
FOR THE QUARTER, THE TOTAL SYSTEM WAS AVAILABLE 47.2% AND WAS UTILIZED 39.4% OF THE TIME.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

---

| | | |
|---|---|---|
| COMPANY NAME | COLORADO UTE ELECTRIC ASSN. | |
| PLANT NAME | CRAIG | |
| UNIT NUMBER | 2 | |
| CITY | CRAIG | |
| STATE | COLORADO | |
| GROSS UNIT GENERATING CAPACITY - MW | 447.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 400.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 447.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 23260. | ( 10000 BTU/LB) |
| AVERAGE ASH CONTENT - % | 8.00 | |
| AVERAGE MOISTURE CONTENT - % | 16.00 | |
| AVERAGE SULFUR CONTENT - % | .45 | |
| AVERAGE CHLORIDE CONTENT - % | .00 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | PEABODY PROCESS SYSTEMS | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 5.4 | |
| INITIAL START-UP DATE | 8/79 | |
| COMMERCIAL START-UP DATE | 6/80 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 85.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.80 | |
| ABSORBER SPARE COMPONENTS INDEX | 1.0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 19.9 | ( 316 GPM) |
| ** DISPOSAL | | |
| TYPE | MINEFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN AT THE END OF THE PERIOD DUE TO TURBINE RELATED PROBLEMS.

WHEN FULL LOAD OPERATIONS WERE ATTEMPTED CONTROL PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBER.

PROBLEMS WITH OPENING/CLOSING THE BYPASS DAMPER HAVE BEEN ENCOUNTERED. LARGER OPERATORS ARE BEING LOOKED AT TO SOLVE THE PROBLEM.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | COLUMBUS & SOUTHERN OHIO ELEC. | |
| PLANT NAME | CONESVILLE | |
| UNIT NUMBER | 5 | |
| CITY | CONESVILLE | |
| STATE | OHIO | |
| GROSS UNIT GENERATING CAPACITY - MW | 411.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 375.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 411.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 25237. | ( 10850 BTU/LB) |
| AVERAGE ASH CONTENT - % | 15.10 | |
| AVERAGE MOISTURE CONTENT - % | 7.50 | |
| AVERAGE SULFUR CONTENT - % | 4.67 | |
| AVERAGE CHLORIDE CONTENT - % | .01 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME | |
| SYSTEM SUPPLIER | AIR CORRECTION DIVISION, UOP | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 3.9 | |
| INITIAL START-UP DATE | 1/77 | |
| COMMERCIAL START-UP DATE | 2/77 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 89.50 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | .00 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 31.5 | ( 500 GPM) |
| ** TREATMENT | | |
| TYPE | POZ-O-TEC | |
| ** DISPOSAL | | |
| TYPE | POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | A | 25.0 | 38.0 | 45.0 | 13.0 | | | | | | |
| | B | 29.0 | 50.0 | 59.0 | 17.0 | | | | | | |
| | SYSTEM | 27.0 | 44.0 | 52.0 | 15.0 | | | 744 | 255 | 112 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY A BOILER OUTAGE OCCURRED FROM THE FIRST OF THE MONTH TO THE TWENTIETH, DURING WHICH TIME MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | A | 90.0 | 63.0 | 77.0 | 31.0 | | | | | | |
| | B | 93.0 | 69.0 | 84.0 | 34.0 | | | | | | |
| | SYSTEM | 92.0 | 66.0 | 81.0 | 33.0 | | | 696 | 348 | 230 | |

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER OUTAGE LASTING APPROXIMATELY 17 DAYS ALSO OCCURRED DURING FEBRUARY.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | A | 88.0 | 82.0 | 82.0 | 82.0 | | | | | | |
| | B | 88.0 | 81.0 | 81.0 | 81.0 | | | | | | |
| | SYSTEM | 88.0 | 82.0 | 82.0 | 82.0 | | | 744 | 744 | 610 | |

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2   PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

      ** PROBLEMS/SOLUTIONS/COMMENTS

                              DURING MARCH PROBLEMS WERE EXPERIENCED WITH THE IUCS SLUDGE STABILIZATION
                              PROCESS AND SOME OUTAGE TIME RESULTED.  ALSO DURING MARCH SOME GRID RODS
                              REQUIRED REPLACING AND SOME RUBBER LINER FAILURES OCCURRED.
```

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                                        SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
-----------------------------------------------------------------------------------------------------

COMPANY NAME                                         COLUMBUS & SOUTHERN OHIO ELEC.
PLANT NAME                                           CONESVILLE
UNIT NUMBER                                          6
CITY                                                 CONESVILLE
STATE                                                OHIO
GROSS UNIT GENERATING CAPACITY - MW                    411.0
NET UNIT GENERATING CAPACITY W/FGD - MW                375.0
EQUIVALENT SCRUBBED CAPACITY - MW                      411.0

** FUEL DATA
    FUEL TYPE                                        COAL
    FUEL GRADE                                       BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                        25237.        ( 10850 BTU/LB)
    AVERAGE ASH CONTENT - %                              15.10
    AVERAGE MOISTURE CONTENT - %                          7.50
    AVERAGE SULFUR CONTENT - %                            4.67
    AVERAGE CHLORIDE CONTENT - %                           .01

** FGD SYSTEM
    GENERAL PROCESS TYPE                             WET SCRUBBING
    PROCESS TYPE                                     LIME
    SYSTEM SUPPLIER                                  AIR CORRECTION DIVISION, UOP
    NEW/RETROFIT                                     NEW
    ENERGY CONSUMPTION - %                               3.9
    INITIAL START-UP DATE                             6/78
    COMMERCIAL START-UP DATE                         **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                  89.50
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %            .00
    ABSORBER SPARE CAPACITY INDEX - %                    .0
    ABSORBER SPARE COMPONENTS INDEX                      .0

** WATER LOOP
    TYPE                                             OPEN
    FRESH MAKE-UP WATER - LITER/S                       31.5        (  500 GPM)

** TREATMENT
    TYPE                                             POZ-O-TEC

** DISPOSAL
    TYPE                                             POND


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  A          88.0         74.0        74.0        74.0
       B          89.0         78.0        78.0        78.0
       SYSTEM     89.0         76.0        76.0        76.0                     744   743    565

       ** PROBLEMS/SOLUTIONS/COMMENTS

                      NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FOR JANUARY.

 2/80  A          87.0         75.0        78.0        69.0
       B          92.0         81.0        85.0        75.0
       SYSTEM     90.0         78.0        82.0        72.0                     696   642    501

       ** PROBLEMS/SOLUTIONS/COMMENTS

                      IN FEBRUARY, MIST ELIMINATOR NOZZLE PLUGGING OCCURRED CAUSING SOME OUTAGE
                      TIME.

 3/80  A          93.0         69.0        69.0        15.0
       B          94.0         76.0        76.0        16.0
       SYSTEM     94.0         73.0        73.0        16.0                     744   163    119
```

COLUMBUS & SOUTHERN OHIO ELEC.: CONESVILLE 6 (CONT.)

```
-----------------------------------------PERFORMANCE DATA----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER  FGD   CAP.
                                                                SO2   PART. HOURS  HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                  THE BOILER WENT DOWN ON MARCH 9TH FOR A BOILER/TURBINE INSPECTION AND
                                  REMAINED DOWN THROUGH THE END OF THE MONTH.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | COOPERATIVE POWER ASSOCIATION | |
| PLANT NAME | COAL CREEK | |
| UNIT NUMBER | 1 | |
| CITY | UNDERWOOD | |
| STATE | NORTH DAKOTA | |
| GROSS UNIT GENERATING CAPACITY - MW | 545.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 495.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 327.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | LIGNITE | |
| AVERAGE HEAT CONTENT - J/G | 14556. | ( 6258 BTU/LB) |
| AVERAGE ASH CONTENT - % | 7.14 | |
| AVERAGE MOISTURE CONTENT - % | 39.83 | |
| AVERAGE SULFUR CONTENT - % | .63 | |
| AVERAGE CHLORIDE CONTENT - % | .02 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME/ALKALINE FLYASH | |
| SYSTEM SUPPLIER | COMBUSTION ENGINEERING | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 8/79 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 90.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.50 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | FLYASH STABILIZATION | |
| ** DISPOSAL | | |
| TYPE | LINED POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | 100.0 | | 96.1 | | | 744 | 715 | 715 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY TWO MODULES AT A TIME WERE TAKEN OFF-LINE FOR INSPECTION AND CLEANING. SOME CRACKED NOZZLES AND PLUGGAGE WERE FOUND DURING THE INSPECTION.

SOME OUTAGE TIME DURING THE MONTH WAS CAUSED BY BOILER RELATED PROBLEMS. A BOILER TRIP WAS CAUSED BY THE TURBINE.

AN HOUR OUTAGE TIME WAS NECESSARY DUE TO A LOSS OF POWER TO THE CONTROL SYSTEM. ABNORMAL DRUM LEVEL WAS ALSO ENCOUNTERED.

A THREE TO FOUR HOUR OUTAGE WAS SCHEDULED TO MAKE REPAIRS ON THE EQUIPMENT.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | SYSTEM | | 100.0 | | 99.9 | | | 696 | 695 | 695 | |

** PROBLEMS/SOLUTIONS/COMMENTS

WHILE THE BOILER WAS OFF-LINE DUE TO ID FAN TROUBLE CAUSED BY ELECTRICAL GROUNDING, TWO MODULES WERE TAKEN OFF LINE SO CALIBRATIONS COULD BE DONE.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | SYSTEM | | 100.0 | | 96.1 | | | 744 | 715 | 715 | |

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER TRIPPED THREE TIMES DURING THE MONTH. ONE TRIP WAS DUE TO THE CUT DOWN OF TRANSMISSION POWER.

THE UNIT WAS DOWN WITH THE BOILER FOR FOUR HOURS TO CLEAN THE FILTER ON THE STATOR COOLING PUMPS.

DURING MARCH STACK EMISSION TESTS WERE RUN. THE SYSTEM OPERATED WITH ONE MODULE DOWN DURING TESTING.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | DUQUESNE LIGHT | |
| PLANT NAME | ELRAMA | |
| UNIT NUMBER | 1-4 | |
| CITY | ELRAMA | |
| STATE | PENNSYLVANIA | |
| GROSS UNIT GENERATING CAPACITY - MW | 510.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 475.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 510.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 26470. | ( 11350 BTU/LB) |
| AVERAGE ASH CONTENT - % | 21.00 | |
| AVERAGE MOISTURE CONTENT - % | ******** | |
| AVERAGE SULFUR CONTENT - % | 2.20 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME | |
| SYSTEM SUPPLIER | CHEMICO | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 3.5 | |
| INITIAL START-UP DATE | 10/75 | |
| COMMERCIAL START-UP DATE | 10/75 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 83.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 | |
| ABSORBER SPARE CAPACITY INDEX - % | 35.0 | |
| ABSORBER SPARE COMPONENTS INDEX | 1.3 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | POZ-O-TEC | |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/79 | 101 | 100.0 | 51.6 | 100.0 | 48.5 | | | | | | |
| | 201 | 100.0 | 90.9 | 100.0 | 85.5 | | | | | | |
| | 301 | 100.0 | 100.0 | 96.1 | 100.0 | | | | | | |
| | 401 | 88.1 | 68.6 | 84.4 | 64.5 | | | | | | |
| | 501 | 100.0 | 100.0 | 100.0 | 100.0 | | | | | | |
| | SYSTEM | 100.0 | 100.0 | 100.0 | 98.7 | | | 744 | 700 | 587 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THERE HAVE BEEN NO SCRUBBER-RELATED OUTAGES OVER THE SEPTEMBER THRU DECEMBER PERIOD.

THE SLUDGE IS NOW BEING TRUCKED TO A REMOTE SITE 10 MILES AWAY CAUSING OPERATING COSTS TO INCREASE.

THE NEW SO2 MONITOR HAS PLUGGED ONLY ONCE SINCE OCTOBER AND HAS REQUIRED ONLY 4 HOURS OF MAINTENANCE PER WEEK.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | 101 | 95.8 | 91.2 | 94.8 | 75.2 | | | | | | |
| | 201 | 87.1 | 100.0 | 87.1 | 87.1 | | | | | | |
| | 301 | 84.6 | 100.0 | 84.6 | 84.6 | | | | | | |

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EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

| PERFORMANCE DATA | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
| | 401 | 86.4 | 55.6 | 77.1 | 45.8 | | | | | | |
| | 501 | 100.0 | 100.0 | 100.0 | 100.0 | | | | | | |
| | SYSTEM | 100.0 | 100.0 | 100.0 | 98.2 | | | 744 | 613 | 528 | |
| 2/80 | 101 | 100.0 | 85.4 | 100.0 | 60.5 | | | | | | |
| | 201 | 100.0 | 100.0 | 100.0 | 96.6 | | | | | | |
| | 301 | 100.0 | 100.0 | 100.0 | 100.0 | | | | | | |
| | 401 | 100.0 | 100.0 | 100.0 | 70.7 | | | | | | |
| | 501 | 77.6 | 56.8 | 64.0 | 40.2 | | | | | | |
| | SYSTEM | 100.0 | 100.0 | 100.0 | 92.0 | | | 696 | 493 | 427 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE SO2 MONITOR IS STILL OPERATING WELL AND HAS LOGGED SIX MONTHS OF OPERATION. THE TWO RUBBER LINED WORMEN RECYCLE PUMPS HAVE NOW LOGGED 14,000 HOURS AS OF FEBRUARY 1980 AND ARE STILL OPERATING WITHOUT ANY MAJOR PROBLEMS. THE HIGH AVAILABILITIES ARE DUE TO THE 5TH MODULE BEING A TRUE SPARE.

THE SO2 MONITOR IS STILL OPERATING WELL AND HAS LOGGED SIX MONTHS OF

| PERIOD | MODULE | PER HOURS |
|---|---|---|
| 3/80 | SYSTEM | 744 |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF MARCH.

```
                                   SECTION 3
             DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
----------------------------------------------------------------------------------------------

COMPANY NAME                                        DUQUESNE LIGHT
PLANT NAME                                          PHILLIPS
UNIT NUMBER                                         1-6
CITY                                                SOUTH HEIGHT
STATE                                               PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW                   408.0
NET UNIT GENERATING CAPACITY W/FGD - MW               373.0
EQUIVALENT SCRUBBED CAPACITY - MW                     410.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       26830.        ( 11535 BTU/LB)
    AVERAGE ASH CONTENT - %                            16.27
    AVERAGE MOISTURE CONTENT - %                        5.02
    AVERAGE SULFUR CONTENT - %                          1.92
    AVERAGE CHLORIDE CONTENT - %                    ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    LIME
    SYSTEM SUPPLIER                                 CHEMICO
    NEW/RETROFIT                                    RETROFIT
    ENERGY CONSUMPTION - %                              3.4
    INITIAL START-UP DATE                            7/73
    COMMERCIAL START-UP DATE                        **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                  83.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.00
    ABSORBER SPARE CAPACITY INDEX - %                  18.0
    ABSORBER SPARE COMPONENTS INDEX                      .6

 ** WATER LOOP
    TYPE                                            OPEN
    FRESH MAKE-UP WATER - LITER/S                   *******         (***** GPM)

 ** TREATMENT
    TYPE                                            POZ-O-TEC

 ** DISPOSAL
    TYPE                                            LANDFILL


------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

12/79   101          .0          .0          .0          .0
        201        99.9       100.0       100.0       100.0
        301        90.7       100.0        90.6        90.0
        401        77.7       100.0        81.2        77.0
        SYSTEM     67.1        75.0        68.0        67.0                     744    567    494

        ** PROBLEMS/SOLUTIONS/COMMENTS

                          PRESENTLY THE UTILITY HAS BEEN ADDING SODIUM THIOSULFATE TO THE LIME TO
                          PREVENT SCALE FORMATION.  THIS PROCESS HAS IMPROVED SO2 COLLECTION AS
                          WELL.

                          THE SCRUBBER FAN HOUSING LINERS ARE BEING REPLACED.

                          THE MECHANICAL COLLECTORS ARE BEING UPGRADED TO IMPROVE THE QUALITY OF
                          THE WET SLUDGE.

 1/80   101          .0          .0          .0          .0
        201        98.1       100.0        98.0        93.3
        301       100.0       100.0       100.0        99.0
        401        97.6       100.0        97.5        96.0
        SYSTEM     73.9        89.0        73.9        72.0                     744    604    536
```

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | 101 | 13.7 | 17.3 | 13.7 | 13.7 | | | | | | |
| | 201 | 91.6 | 100.0 | 91.7 | 91.7 | | | | | | |
| | 301 | 86.2 | 100.0 | 86.0 | 84.6 | | | | | | |
| | 401 | 94.2 | 100.0 | 94.2 | 90.5 | | | | | | |
| | SYSTEM | 71.4 | 79.3 | 71.4 | 70.1 | | | 696 | 551 | 488 | |

** PROBLEMS/SOLUTIONS/COMMENTS

SODIUM THIOSULFATE ADDITION CONTINUED THROUGH THE FIRST QUARTER AND THE MIST ELIMINATOR SCALING HAS BEEN SIGNIFICANTLY REDUCED. 2000-5000 HOURS OF OPERATION HAVE BEEN LOGGED WITHOUT MIST ELIMINATOR SCALE UP. THE UTILITY REPORTS THAT SO2 REMOVAL EFFICIENCY HAS IMPROVED 3% DUE TO THIS AS WELL. THE UTILITY IS LOOKING INTO THE ADDITION OF SODIUM THIOSULFATE AT ELRAMA.

THE FAN RUBBER LINERS HAVE BEEN A CONTINUAL PROBLEM. TWO WILL BE REPLACED WITH INCONEL THE NEXT TIME THE RUBBER LINERS FAIL.

THE PHILLIPS FGD SYSTEM HAD A SYSTEM AVAILABILITY OF 71.8% FOR THE YEAR 1979.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF MARCH.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | INDIANAPOLIS POWER & LIGHT | |
| PLANT NAME | PETERSBURG | |
| UNIT NUMBER | 3 | |
| CITY | PETERSBURG | |
| STATE | INDIANA | |
| GROSS UNIT GENERATING CAPACITY - MW | 532.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 515.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 532.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 25004. | ( 10750 BTU/LB) |
| AVERAGE ASH CONTENT - % | ******** | |
| AVERAGE MOISTURE CONTENT - % | ******** | |
| AVERAGE SULFUR CONTENT - % | 3.25 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | AIR CORRECTION DIVISION, UOP | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 2.4 | |
| INITIAL START-UP DATE | 12/77 | |
| COMMERCIAL START-UP DATE | 12/77 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 65.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.30 | |
| ABSORBER SPARE COMPONENTS INDEX | .6 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 55.6 | ( 882 GPM) |
| ** TREATMENT | | |
| TYPE | POZ-O-TEC | |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1980, THE ENTIRE SCRUBBER PACKING BED WAS LOST DUE TO EXCESSIVE WEAR OF THE NEOPRENE FOAM PACKING BALLS. THESE ARE TO BE REPLACED IN APRIL, AT WHICH TIME THE UNIT WILL BE TAKEN OFF LINE TO ACCOMODATE THE REPAIR.

BYPASS DAMPER FAILURES ALSO OCCURRED AND ARE REPORTED TO BE A CONTINUAL PROBLEM. MODIFICATIONS WERE MADE TO THE GULLOTINE TYPE DAMPERS DURING THE PERIOD.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | KANSAS CITY POWER & LIGHT | |
| PLANT NAME | HAWTHORN | |
| UNIT NUMBER | 3 | |
| CITY | KANSAS CITY | |
| STATE | MISSOURI | |
| GROSS UNIT GENERATING CAPACITY - MW | 90.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 85.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 90.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 22795. | ( 9800 BTU/LB) |
| AVERAGE ASH CONTENT - % | 11.00 | |
| AVERAGE MOISTURE CONTENT - % | ********* | |
| AVERAGE SULFUR CONTENT - % | .60 | |
| AVERAGE CHLORIDE CONTENT - % | ********* | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME | |
| SYSTEM SUPPLIER | COMBUSTION ENGINEERING | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 2.2 | |
| INITIAL START-UP DATE | 11/72 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 70.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 | |
| ABSORBER SPARE COMPONENTS INDEX | .6 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | FLYASH STABILIZATION | |
| ** DISPOSAL | | |
| TYPE | POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | 100.0 | 100.0 | | 91.0 | | | 744 | 677 | 677 | |
| 11/79 | SYSTEM | 100.0 | 100.0 | | 38.0 | | | 720 | 274 | 274 | |
| 12/79 | SYSTEM | 100.0 | 100.0 | | 92.0 | | | 744 | 684 | 684 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE VIRTUALLY 100% OF THE TIME THE BOILER OPERATED. THE LOW NOVEMBER FIGURES ARE DUE TO A 406 HOUR BOILER OUTAGE CAUSED BY SUPERHEAT TUBE LEAKS AND A 42 HOUR OUTAGE CAUSED BY ECONOMIZER LEAKS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | 100.0 | 100.0 | | 93.0 | | | 744 | 692 | 692 | |
| 2/80 | SYSTEM | 100.0 | 100.0 | | 100.0 | | | 696 | 696 | 696 | |
| 3/80 | SYSTEM | 100.0 | 100.0 | | 100.0 | | | 744 | 744 | 744 | |

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

```
-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

      ** PROBLEMS/SOLUTIONS/COMMENTS

                        THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME THE BOILER OPERATED.  NO
                        PROBLEMS WERE ENCOUNTERED.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | |
|---|---|
| COMPANY NAME | KANSAS CITY POWER & LIGHT |
| PLANT NAME | HAWTHORN |
| UNIT NUMBER | 4 |
| CITY | KANSAS CITY |
| STATE | MISSOURI |
| GROSS UNIT GENERATING CAPACITY - MW | 90.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 85.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 90.0 |
| ** FUEL DATA | |
| FUEL TYPE | COAL |
| FUEL GRADE | BITUMINOUS |
| AVERAGE HEAT CONTENT - J/G | 22795. ( 9800 BTU/LB) |
| AVERAGE ASH CONTENT - % | 11.00 |
| AVERAGE MOISTURE CONTENT - % | ******** |
| AVERAGE SULFUR CONTENT - % | .60 |
| AVERAGE CHLORIDE CONTENT - % | ******** |
| ** FGD SYSTEM | |
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | LIME |
| SYSTEM SUPPLIER | COMBUSTION ENGINEERING |
| NEW/RETROFIT | RETROFIT |
| ENERGY CONSUMPTION - % | 2.2 |
| INITIAL START-UP DATE | 8/72 |
| COMMERCIAL START-UP DATE | **/** |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 70.00 |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 |
| ABSORBER SPARE COMPONENTS INDEX | .6 |
| ** WATER LOOP | |
| TYPE | CLOSED |
| FRESH MAKE-UP WATER - LITER/S | ******** (***** GPM) |
| ** TREATMENT | |
| TYPE | FLYASH STABILIZATION |
| ** DISPOSAL | |
| TYPE | POND |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | 100.0 | 100.0 | | 89.0 | | | 744 | 662 | 662 | |
| 11/79 | SYSTEM | 100.0 | 100.0 | | 40.0 | | | 720 | 288 | 268 | |
| 12/79 | SYSTEM | 100.0 | | | .0 | | | 744 | 0 | 0 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WENT DOWN ON NOVEMBER 26TH FOR A TURBINE GENERATOR OVERHAUL.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | 100.0 | | | .0 | | | 744 | 0 | 0 | |
| 2/80 | SYSTEM | 100.0 | | | .0 | | | 696 | 0 | 0 | |
| 3/80 | SYSTEM | 100.0 | | | .0 | | | 744 | 0 | 0 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF LINE THROUGH THE FIRST QUARTER 1980 BECAUSE OF THE TURBINE GENERATOR OVERHAUL.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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------------------------------------------------------------------------------------------------------------------------------

COMPANY NAME                                     KANSAS CITY POWER & LIGHT
PLANT NAME                                       LA CYGNE
UNIT NUMBER                                      1
CITY                                             LA CYGNE
STATE                                            KANSAS
GROSS UNIT GENERATING CAPACITY - MW                874.0
NET UNIT GENERATING CAPACITY W/FGD - MW            820.0
EQUIVALENT SCRUBBED CAPACITY - MW                  874.0

** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                    21913.          ( 9421 BTU/LB)
    AVERAGE ASH CONTENT - %                          24.36
    AVERAGE MOISTURE CONTENT - %                      8.60
    AVERAGE SULFUR CONTENT - %                        5.39
    AVERAGE CHLORIDE CONTENT - %                       .03

** FGD SYSTEM
    GENERAL PROCESS TYPE                         WET SCRUBBING
    PROCESS TYPE                                 LIMESTONE
    SYSTEM SUPPLIER                              BABCOCK & WILCOX
    NEW/RETROFIT                                 NEW
    ENERGY CONSUMPTION - %                            2.7
    INITIAL START-UP DATE                         2/73
    COMMERCIAL START-UP DATE                      6/73
    SO2 DESIGN REMOVAL EFFICIENCY - %               80.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.50
    ABSORBER SPARE COMPONENTS INDEX                    .6

** WATER LOOP
    TYPE                                         CLOSED
    FRESH MAKE-UP WATER - LITER/S                   72.3          ( 1148 GPM)

** DISPOSAL
    TYPE                                         UNLINED POND


-------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                                                              744

 2/80  SYSTEM                                                              696

 3/80  SYSTEM                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                    NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----------------------------------------------------------------------------------------------------------

 COMPANY NAME                                     KANSAS POWER & LIGHT
 PLANT NAME                                       JEFFREY
 UNIT NUMBER                                      1
 CITY                                             WAMEGO
 STATE                                            KANSAS
 GROSS UNIT GENERATING CAPACITY - MW                720.0
 NET UNIT GENERATING CAPACITY W/FGD - MW            680.0
 EQUIVALENT SCRUBBED CAPACITY - MW                  540.0

 ** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   ******
     AVERAGE HEAT CONTENT - J/G                    19899.        (  8125 BTU/LB)
     AVERAGE ASH CONTENT - %                           5.80
     AVERAGE MOISTURE CONTENT - %                     28.00
     AVERAGE SULFUR CONTENT - %                         .32
     AVERAGE CHLORIDE CONTENT - %                       .01

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                         WET SCRUBBING
     PROCESS TYPE                                 LIMESTONE
     SYSTEM SUPPLIER                              COMBUSTION ENGINEERING
     NEW/RETROFIT                                 NEW
     ENERGY CONSUMPTION - %                       *******
     INITIAL START-UP DATE                         8/78
     COMMERCIAL START-UP DATE                     **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                80.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %        99.00
     ABSORBER SPARE CAPACITY INDEX - %                20.0
     ABSORBER SPARE COMPONENTS INDEX                   1.0

 ** WATER LOOP
     TYPE                                         CLOSED
     FRESH MAKE-UP WATER - LITER/S                   35.1        (  557 GPM)

 ** DISPOSAL
     TYPE                                         POND


----------------------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                 SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                                                                 744

 2/80  SYSTEM                                                                 696

 3/80  SYSTEM                                                                 744

         ** PROBLEMS/SOLUTIONS/COMMENTS

                               NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1980.  SOME
                               INTAKE MIXER MODIFICATIONS WERE PERFORMED.
```

```
                              SECTION 3
          DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
-----------------------------------------------------------------------------------------

COMPANY NAME                                       KANSAS POWER & LIGHT
PLANT NAME                                         LAWRENCE
UNIT NUMBER                                        4
CITY                                               LAWRENCE
STATE                                              KANSAS
GROSS UNIT GENERATING CAPACITY - MW                  125.0
NET UNIT GENERATING CAPACITY W/FGD - MW              115.0
EQUIVALENT SCRUBBED CAPACITY - MW                    125.0

** FUEL DATA
     FUEL TYPE                                     COAL
     FUEL GRADE                                    ******
     AVERAGE HEAT CONTENT - J/G                     23260.          ( 10000 BTU/LB)
     AVERAGE ASH CONTENT - %                           9.80
     AVERAGE MOISTURE CONTENT - %                     12.00
     AVERAGE SULFUR CONTENT - %                         .55
     AVERAGE CHLORIDE CONTENT - %                       .03

** FGD SYSTEM
     GENERAL PROCESS TYPE                          WET SCRUBBING
     PROCESS TYPE                                  LIMESTONE
     SYSTEM SUPPLIER                               COMBUSTION ENGINEERING
     NEW/RETROFIT                                  RETROFIT
     ENERGY CONSUMPTION - %                        *******
     INITIAL START-UP DATE                          1/76
     COMMERCIAL START-UP DATE                      **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                73.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %        98.90
     ABSORBER SPARE CAPACITY INDEX - %                  .0
     ABSORBER SPARE COMPONENTS INDEX                    .0

** WATER LOOP
     TYPE                                          CLOSED
     FRESH MAKE-UP WATER - LITER/S                 *******         (***** GPM)

** TREATMENT
     TYPE                                          FORCED OXIDATION

** DISPOSAL
     TYPE                                          POND


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                 100.0                   100.0                   744    744    744

 2/80  SYSTEM                 100.0                   100.0                   696    696    696

 3/80  SYSTEM                 100.0                   100.0                   744    744    744

     ** PROBLEMS/SOLUTIONS/COMMENTS

                    NO MAJOR PROBLEMS WERE REPORTED TO HAVE BEEN EXPERIENCED WITH THE
                    LAWRENCE 4 SCRUBBER DURING THE FIRST QUARTER 1980.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | KANSAS POWER & LIGHT | |
| PLANT NAME | LAWRENCE | |
| UNIT NUMBER | 5 | |
| CITY | LAWRENCE | |
| STATE | KANSAS | |
| GROSS UNIT GENERATING CAPACITY - MW | 420.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 400.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 420.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 23260. | ( 10000 BTU/LB) |
| AVERAGE ASH CONTENT - % | 9.80 | |
| AVERAGE MOISTURE CONTENT - % | 12.00 | |
| AVERAGE SULFUR CONTENT - % | .55 | |
| AVERAGE CHLORIDE CONTENT - % | .03 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | COMBUSTION ENGINEERING | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 11/71 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 52.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 98.90 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | FORCED OXIDATION | |
| ** DISPOSAL | | |
| TYPE | POND | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | 100.0 | | 100.0 | | | 744 | 744 | 744 | |
| 2/80 | SYSTEM | | 100.0 | | 51.7 | | | 696 | 360 | 360 | |
| 3/80 | SYSTEM | | 100.0 | | 54.8 | | | 744 | 408 | 408 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE LAWRENCE 5 SCRUBBER OPERATED WITHOUT ANY MAJOR PROBLEMS DURING THE FIRST QUARTER 1980. THE BOILER WAS DOWN FROM THE MIDDLE OF FEBRUARY TO THE MIDDLE OF MARCH FOR TURBINE REPAIRS, DURING WHICH TIME SCRUBBER MAINTENANCE WAS PERFORMED.

```
                              SECTION 3
           DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
--------------------------------------------------------------------------------------------

COMPANY NAME                                       KENTUCKY UTILITIES
PLANT NAME                                         GREEN RIVER
UNIT NUMBER                                        1-3
CITY                                               CENTRAL CITY
STATE                                              KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW                   64.0
NET UNIT GENERATING CAPACITY W/FGD - MW               60.0
EQUIVALENT SCRUBBED CAPACITY - MW                     64.0

** FUEL DATA
   FUEL TYPE                                       COAL
   FUEL GRADE                                      BITUMINOUS
   AVERAGE HEAT CONTENT - J/G                       25586.          ( 11000 BTU/LB)
   AVERAGE ASH CONTENT - %                             13.40
   AVERAGE MOISTURE CONTENT - %                        12.10
   AVERAGE SULFUR CONTENT - %                           4.00
   AVERAGE CHLORIDE CONTENT - %                    ********

** FGD SYSTEM
   GENERAL PROCESS TYPE                            WET SCRUBBING
   PROCESS TYPE                                    LIME
   SYSTEM SUPPLIER                                 AMERICAN AIR FILTER
   NEW/RETROFIT                                    RETROFIT
   ENERGY CONSUMPTION - %                               3.1
   INITIAL START-UP DATE                           9/75
   COMMERCIAL START-UP DATE                        6/76
   SO2 DESIGN REMOVAL EFFICIENCY - %                   80.00
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %           99.50
   ABSORBER SPARE CAPACITY INDEX - %                     .0
   ABSORBER SPARE COMPONENTS INDEX                       .0

** WATER LOOP
   TYPE                                            CLOSED
   FRESH MAKE-UP WATER - LITER/S                        4.7         (   75 GPM)

** DISPOSAL
   TYPE                                            LINED POND


-------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM     100.0                                 .0                 744    0

 2/80  SYSTEM     100.0                                 .0                 696    0

 3/80  SYSTEM     100.0                                 .0                 744    0

        ** PROBLEMS/SOLUTIONS/COMMENTS

                 THE BOILER REMAINED OUT OF SERVICE DUE TO BOILER REPAIRS.  THE UNIT IS
                 EXPECTED TO BE OPERATING IN ANOTHER MONTH.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | LOUISVILLE GAS & ELECTRIC | |
| PLANT NAME | CANE RUN | |
| UNIT NUMBER | 4 | |
| CITY | LOUISVILLE | |
| STATE | KENTUCKY | |
| GROSS UNIT GENERATING CAPACITY - MW | 188.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 175.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 168.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 26749. | ( 11500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 17.10 | |
| AVERAGE MOISTURE CONTENT - % | 9.00 | |
| AVERAGE SULFUR CONTENT - % | 3.75 | |
| AVERAGE CHLORIDE CONTENT - % | .04 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME | |
| SYSTEM SUPPLIER | AMERICAN AIR FILTER | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 1.6 | |
| INITIAL START-UP DATE | 8/76 | |
| COMMERCIAL START-UP DATE | 9/77 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 85.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 6.3 | ( 100 GPM) |
| ** DISPOSAL | | |
| TYPE | LINED POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | 100.0 | | 95.6 | | | 744 | 711 | 711 | |
| 2/80 | SYSTEM | | 99.8 | | 66.7 | | | 696 | 465 | 464 | |
| 3/80 | SYSTEM | | 80.5 | | 74.3 | | | 744 | 687 | 553 | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED FOR THE FIRST QUARTER 1980 WITH EITHER THE BOILER OR THE FGD SYSTEM.

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SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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------------------------------------------------------------------------------------------------------------------------

COMPANY NAME                                        LOUISVILLE GAS & ELECTRIC
PLANT NAME                                          CANE RUN
UNIT NUMBER                                         5
CITY                                                LOUISVILLE
STATE                                               KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW                  200.0
NET UNIT GENERATING CAPACITY W/FGD - MW              192.0
EQUIVALENT SCRUBBED CAPACITY - MW                    200.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       26749.          ( 11500 BTU/LB)
    AVERAGE ASH CONTENT - %                             17.10
    AVERAGE MOISTURE CONTENT - %                         9.00
    AVERAGE SULFUR CONTENT - %                           3.75
    AVERAGE CHLORIDE CONTENT - %                          .04

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    LIME
    SYSTEM SUPPLIER                                 COMBUSTION ENGINEERING
    NEW/RETROFIT                                    RETROFIT
    ENERGY CONSUMPTION - %                              1.5
    INITIAL START-UP DATE                           12/77
    COMMERCIAL START-UP DATE                         7/78
    SO2 DESIGN REMOVAL EFFICIENCY - %                   85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %           99.00
    ABSORBER SPARE CAPACITY INDEX - %                     .0
    ABSORBER SPARE COMPONENTS INDEX                       .0

** WATER LOOP
    TYPE                                            OPEN
    FRESH MAKE-UP WATER - LITER/S                   *******          (***** GPM)

** TREATMENT
    TYPE                                            POZ-O-TEC

** DISPOSAL
    TYPE                                            LINED POND


----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                 92.1                    72.2                   744   583    537

       ** PROBLEMS/SOLUTIONS/COMMENTS

                   DURING JANUARY NO OPERATIONAL PROBLEMS WERE ENCOUNTERED.

 2/80  SYSTEM                 71.9                    49.7                   696   481    346

 3/80  SYSTEM                 44.5                    27.2                   744   454    202

       ** PROBLEMS/SOLUTIONS/COMMENTS

                            IN FEBRUARY THE UTILITY RAN OUT OF CARBIDE LIME CAUSING INTERRUPTION OF
                            THE FGD SYSTEM OPERATION.  THE UNAVAILABILITY OF LIME WAS CAUSED BY FREEZE
                            UPS ENCOUNTERED BY AIRCO, THE LIME SUPPLIER.

                            REHEATER TUBE PROBLEMS WERE ALSO ENCOUNTERED IN FEBRUARY AND CONTINUED
                            THROUGH MARCH.  THE UTILITY HOPES TO REPLACE THE TUBE BUNDLES IN THE
                            SUMMER.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----------------------------------------------------------------------------------------------------------

COMPANY NAME                                    LOUISVILLE GAS & ELECTRIC
PLANT NAME                                      CANE RUN
UNIT NUMBER                                     6
CITY                                            LOUISVILLE
STATE                                           KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW               299.0
NET UNIT GENERATING CAPACITY W/FGD - MW           277.0
EQUIVALENT SCRUBBED CAPACITY - MW                 299.0

** FUEL DATA
   FUEL TYPE                                    COAL
   FUEL GRADE                                   BITUMINOUS
   AVERAGE HEAT CONTENT - J/G                    25586.         ( 11000 BTU/LB)
   AVERAGE ASH CONTENT - %                         17.10
   AVERAGE MOISTURE CONTENT - %                     9.00
   AVERAGE SULFUR CONTENT - %                       4.80
   AVERAGE CHLORIDE CONTENT - %                      .04

** FGD SYSTEM
   GENERAL PROCESS TYPE                         WET SCRUBBING
   PROCESS TYPE                                 DUAL ALKALI
   SYSTEM SUPPLIER                              ADL/COMBUSTION EQUIP ASSOCIATE
   NEW/RETROFIT                                 RETROFIT
   ENERGY CONSUMPTION - %                          1.0
   INITIAL START-UP DATE                         4/79
   COMMERCIAL START-UP DATE                     **/**
   SO2 DESIGN REMOVAL EFFICIENCY - %              95.00
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.00
   ABSORBER SPARE CAPACITY INDEX - %              20.0
   ABSORBER SPARE COMPONENTS INDEX                  .3

** WATER LOOP
   TYPE                                         CLOSED
   FRESH MAKE-UP WATER - LITER/S                *******         (***** GPM)

** DISPOSAL
   TYPE                                         LANDFILL


-------------------------------------------PERFORMANCE DATA-------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                 49.0                     13.8                 744   210    103

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         FGD SYSTEM OUTAGE TIME IN JANUARY WAS CAUSED BY THE LOSS OF THE THICKENER.
                         THE RAKE WOULDN'T TURN AND THE THICKENER HAD TO BE CLEANED OUT.

 2/80  SYSTEM                 84.7                     47.0                 696   386    327

 3/80  SYSTEM                 70.0                     64.5                 744   686    480

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         IN FEBRUARY AND MARCH OUTAGE TIME WAS CAUSED BY PROBLEMS WITH THE RECYCLE
                         PUMPS.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | LOUISVILLE GAS & ELECTRIC | |
| PLANT NAME | MILL CREEK | |
| UNIT NUMBER | 3 | |
| CITY | LOUISVILLE | |
| STATE | KENTUCKY | |
| GROSS UNIT GENERATING CAPACITY - MW | 442.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 420.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 442.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 26749. | ( 11500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 11.50 | |
| AVERAGE MOISTURE CONTENT - % | ******** | |
| AVERAGE SULFUR CONTENT - % | 3.75 | |
| AVERAGE CHLORIDE CONTENT - % | .04 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME | |
| SYSTEM SUPPLIER | AMERICAN AIR FILTER | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 1.6 | |
| INITIAL START-UP DATE | 8/78 | |
| COMMERCIAL START-UP DATE | 3/79 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 85.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 | |
| ABSORBER SPARE COMPONENTS INDEX | .3 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 9.4 | ( 150 GPM) |
| ** TREATMENT | | |
| TYPE | FLYASH/LIME STABILIZATION | |
| ** DISPOSAL | | |
| TYPE | POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | .0 | | | 744 | 0 | 0 | |
| 2/80 | SYSTEM | | 36.1 | | 26.6 | | | 696 | 512 | 185 | |
| 3/80 | SYSTEM | | 36.9 | | 30.6 | | | 744 | 618 | 228 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE ON FEBRUARY 10TH AFTER THE TURBINE OVERHAUL WORK WAS COMPLETED.

PROBLEMS ENCOUNTERED DURING FEBRUARY AND MARCH WITH THE FGD SYSTEM OPERATION INCLUDED FROZEN WATER LINES AND WORN GASKETS BLOWING IN THE REHEATER FLANGES.

```
                                        SECTION 3
                   DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
-------------------------------------------------------------------------------------------------------

   COMPANY NAME                                      LOUISVILLE GAS & ELECTRIC
   PLANT NAME                                        PADDY'S RUN
   UNIT NUMBER                                       6
   CITY                                              LOUISVILLE
   STATE                                             KENTUCKY
   GROSS UNIT GENERATING CAPACITY - MW                 72.0
   NET UNIT GENERATING CAPACITY W/FGD - MW             67.0
   EQUIVALENT SCRUBBED CAPACITY - MW                   72.0

   ** FUEL DATA
       FUEL TYPE                                     COAL
       FUEL GRADE                                    BITUMINOUS
       AVERAGE HEAT CONTENT - J/G                     26749.        ( 11500 BTU/LB)
       AVERAGE ASH CONTENT - %                           11.50
       AVERAGE MOISTURE CONTENT - %                  ********
       AVERAGE SULFUR CONTENT - %                         2.50
       AVERAGE CHLORIDE CONTENT - %                  ********

   ** FGD SYSTEM
       GENERAL PROCESS TYPE                          WET SCRUBBING
       PROCESS TYPE                                  LIME
       SYSTEM SUPPLIER                               COMBUSTION ENGINEERING
       NEW/RETROFIT                                  RETROFIT
       ENERGY CONSUMPTION - %                           2.8
       INITIAL START-UP DATE                         4/73
       COMMERCIAL START-UP DATE                      **/**
       SO2 DESIGN REMOVAL EFFICIENCY - %               90.00
       PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.10
       ABSORBER SPARE CAPACITY INDEX - %                 .0
       ABSORBER SPARE COMPONENTS INDEX                   .0

   ** WATER LOOP
       TYPE                                          CLOSED
       FRESH MAKE-UP WATER - LITER/S                    3.1        (   50 GPM)

   ** TREATMENT
       TYPE                                          LIME STABILIZATION

   ** DISPOSAL
       TYPE                                          POND


------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                                          .0                  744     0      0

 2/80  SYSTEM                                          .0                  696     0      0

 3/80  SYSTEM                                          .0                  744            0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                       THIS UNIT DID NOT OPERATE DURING THE FIRST QUARTER 1980 DUE TO A LACK OF
                       DEMAND.  THIS UNIT IS USED AS A PEAKING UNIT AND WILL BE RETIRED SOMETIME
                       IN 1987.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | MINNKOTA POWER COOPERATIVE | |
| PLANT NAME | MILTON R. YOUNG | |
| UNIT NUMBER | 2 | |
| CITY | CENTER | |
| STATE | NORTH DAKOTA | |
| GROSS UNIT GENERATING CAPACITY - MW | 440.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 402.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 405.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | LIGNITE | |
| AVERAGE HEAT CONTENT - J/G | 15119. | ( 6500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 6.50 | |
| AVERAGE MOISTURE CONTENT - % | 38.00 | |
| AVERAGE SULFUR CONTENT - % | .70 | |
| AVERAGE CHLORIDE CONTENT - % | .01 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME/ALKALINE FLYASH | |
| SYSTEM SUPPLIER | ADL/COMBUSTION EQUIP ASSOCIATE | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 1.6 | |
| INITIAL START-UP DATE | 9/77 | |
| COMMERCIAL START-UP DATE | 6/78 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 65.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.60 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 44.1 | ( 700 GPM) |
| ** DISPOSAL | | |
| TYPE | MINEFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | A | 67.7 | 10.5 | | 7.1 | | | | | | |
| | B | 67.7 | .0 | | .0 | | | | | | |
| | SYSTEM | 7.1 | 10.5 | 10.5 | 7.1 | | | 744 | 504 | 27 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE COLD WEATHER CAUSED SOME FROZEN LINES AND THE BOOSTER FAN TO FREEZE.

A HIGH PERCENTAGE OF COARSE SOLIDS IN THE THICKENER CAUSED SOME OUTAGE TIME. THE WARM GEAR ON THE THICKENER ALSO BROKE CAUSING PROBLEMS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | A | .0 | .0 | | .0 | | | | | | |
| | B | .0 | .0 | | .0 | | | | | | |
| | SYSTEM | .0 | .0 | | .0 | | | 696 | 696 | 0 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE PROBLEMS RELATED TO THE COLD WEATHER CONTINUED THROUGH FEBRUARY. THE ICE ON THE BOOSTER FAN HAD TO BE MELTED.

THE SHAFT SLEEVES ON SEVERAL SPRAY RECYCLE PUMPS WERE REPLACED.

THE GEAR REDUCER FAILED ON THE B-SIDE ABSORBER AGITATOR CAUSING PROBLEMS.

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

## PERFORMANCE DATA

THE ISOLATION DAMPER CHAINS BROKE DURING THE MONTH.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | A | 28.9 | 22.6 | | 22.6 | | | | | | |
| | B | 28.9 | 6.2 | | 6.2 | | | | | | |
| | SYSTEM | 28.9 | 28.8 | 28.8 | 28.8 | | | 744 | 743 | 107 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH COLD WEATHER CONTINUED TO BE A PROBLEM.

THE TORQUE SWITCHES ON THE ISOLATION DAMPERS WERE REPLACED. THE DAMPER PROBLEMS CAUSED THE BOOSTER FAN TO TRIP.

AN EXCESSIVE AMOUNT OF COARSE PARTICLES IN THE THICKENER CONTINUED TO BE A PROBLEM. PLUGGED BLEED LINES FROM THE ABSORBER TO THE THICKENER WERE ALSO ENCOUNTERED.

THE A-SIDE ABSORBER AGITATOR EXPERIENCED A PROBLEM WITH THE ANCHOR BOLTS SHEARING.

THE SHAFT SLEEVES ON THE SPRAY RECYCLE PUMPS WOULD NOT HOLD THE PACKING SO THEY HAD TO BE REPLACED IN MARCH.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | MONTANA POWER | |
| PLANT NAME | COLSTRIP | |
| UNIT NUMBER | 1 | |
| CITY | COLSTRIP | |
| STATE | MONTANA | |
| GROSS UNIT GENERATING CAPACITY - MW | 360.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 332.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 360.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 20569. | ( 8843 BTU/LB) |
| AVERAGE ASH CONTENT - % | 8.60 | |
| AVERAGE MOISTURE CONTENT - % | 23.90 | |
| AVERAGE SULFUR CONTENT - % | .77 | |
| AVERAGE CHLORIDE CONTENT - % | .01 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME/ALKALINE FLYASH | |
| SYSTEM SUPPLIER | ADL/COMBUSTION EQUIP ASSOCIATE | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 3.3 | |
| INITIAL START-UP DATE | 9/75 | |
| COMMERCIAL START-UP DATE | 11/75 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 60.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.50 | |
| ABSORBER SPARE CAPACITY INDEX - % | 20.0 | |
| ABSORBER SPARE COMPONENTS INDEX | .5 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 23.3 | ( 370 GPM) |
| ** DISPOSAL | | |
| TYPE | POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL | | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |
| 12/79 | SYSTEM | | | | | | | 744 | | | |
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE PERIOD OF DECEMBER 1979 THROUGH MARCH 1980.

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## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | MONTANA POWER | |
| PLANT NAME | COLSTRIP | |
| UNIT NUMBER | 2 | |
| CITY | COLSTRIP | |
| STATE | MONTANA | |
| GROSS UNIT GENERATING CAPACITY - MW | 360.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 332.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 360.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 20549. | ( 8843 BTU/LB) |
| AVERAGE ASH CONTENT - % | 9.60 | |
| AVERAGE MOISTURE CONTENT - % | 23.90 | |
| AVERAGE SULFUR CONTENT - % | .77 | |
| AVERAGE CHLORIDE CONTENT - % | .01 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME/ALKALINE FLYASH | |
| SYSTEM SUPPLIER | ADL/COMBUSTION EQUIP ASSOCIATE | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 1.3 | |
| INITIAL START-UP DATE | 5/76 | |
| COMMERCIAL START-UP DATE | 10/76 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 60.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.50 | |
| ABSORBER SPARE CAPACITY INDEX - % | 20.0 | |
| ABSORBER SPARE COMPONENTS INDEX | .5 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 23.3 | ( 370 GPM) |
| ** DISPOSAL | | |
| TYPE | POND | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/79 | SYSTEM | | | | | | | 744 | | | |
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE PERIOD FROM DECEMBER 1979 THROUGH MARCH 1980.

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                                          SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
------------------------------------------------------------------------------------------------

COMPANY NAME                                      NEVADA POWER
PLANT NAME                                        REID GARDNER
UNIT NUMBER                                       1
CITY                                              MOAPA
STATE                                             NEVADA
GROSS UNIT GENERATING CAPACITY - MW                 125.0
NET UNIT GENERATING CAPACITY W/FGD - MW             110.0
EQUIVALENT SCRUBBED CAPACITY - MW                   125.0

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                     28959.        ( 12450 BTU/LB)
    AVERAGE ASH CONTENT - %                           8.00
    AVERAGE MOISTURE CONTENT - %                      5.50
    AVERAGE SULFUR CONTENT - %                         .50
    AVERAGE CHLORIDE CONTENT - %                       .05

** FGD SYSTEM
    GENERAL PROCESS TYPE                          WET SCRUBBING
    PROCESS TYPE                                  SODIUM CARBONATE
    SYSTEM SUPPLIER                               ADL/COMBUSTION EQUIP ASSOCIATE
    NEW/RETROFIT                                  RETROFIT
    ENERGY CONSUMPTION - %                        *******
    INITIAL START-UP DATE                          4/74
    COMMERCIAL START-UP DATE                      **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                90.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        97.00
    ABSORBER SPARE CAPACITY INDEX - %                  .0
    ABSORBER SPARE COMPONENTS INDEX                    .0

** WATER LOOP
    TYPE                                          CLOSED
    FRESH MAKE-UP WATER - LITER/S                     9.8        (  155 GPM)

** DISPOSAL
    TYPE                                          LINED POND


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM     100.0        100.0       100.0       100.0                  744   744   744

        ** PROBLEMS/SOLUTIONS/COMMENTS

                   THE BOILER AND FGD SYSTEM OPERATED THE ENTIRE MONTH WITH NO OUTAGES.

 2/80  SYSTEM     100.0        100.0       100.0       100.0                  696   696   696

        ** PROBLEMS/SOLUTIONS/COMMENTS

                   DURING FEBRUARY, NO OUTAGES OCCURRED.

 3/80  SYSTEM      66.2         83.7        84.7        33.8                  744   300   251

        ** PROBLEMS/SOLUTIONS/COMMENTS

                   DURING THE FIRST OF MARCH THE FGD SYSTEM WAS OFF LINE FOR A SCHEDULED
                   OVERHAUL.

                   THE FGD UNIT WAS FORCED DOWN ONCE TO REPAIR THE VENTURI PUMP AND SIX OTHER
                   TIMES DUE TO LOW VENTURI FLOW.
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                                  SECTION 3
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
---------------------------------------------------------------------------------------------------

 COMPANY NAME                                       NEVADA POWER
 PLANT NAME                                         REID GARDNER
 UNIT NUMBER                                        2
 CITY                                               MOAPA
 STATE                                              NEVADA
 GROSS UNIT GENERATING CAPACITY - MW                  125.0
 NET UNIT GENERATING CAPACITY W/FGD - MW              110.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    125.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                      28959.          ( 12450 BTU/LB)
     AVERAGE ASH CONTENT - %                            8.00
     AVERAGE MOISTURE CONTENT - %                       5.50
     AVERAGE SULFUR CONTENT - %                          .50
     AVERAGE CHLORIDE CONTENT - %                        .05

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   SODIUM CARBONATE
     SYSTEM SUPPLIER                                ADL/COMBUSTION EQUIP ASSOCIATE
     NEW/RETROFIT                                   RETROFIT
     ENERGY CONSUMPTION - %                         *******
     INITIAL START-UP DATE                           4/74
     COMMERCIAL START-UP DATE                       **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                 90.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %         97.00
     ABSORBER SPARE CAPACITY INDEX - %                    .0
     ABSORBER SPARE COMPONENTS INDEX                      .0

 ** WATER LOOP
     TYPE                                           CLOSED
     FRESH MAKE-UP WATER - LITER/S                      9.8          (  155 GPM)

 ** DISPOSAL
     TYPE                                           LINED POND


---------------------------------------------PERFORMANCE DATA--------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM     97.3         96.9        96.9        81.6                 744   627    607

       ** PROBLEMS/SOLUTIONS/COMMENTS

                              DURING JANUARY THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPLACE THE
                              REBUILT NO. 2 HIGH PRESSURE HEATER.  THIS OUTAGE LASTED APPROXIMATELY
                              112 HOURS.

                              REPAIRS WERE NEEDED ON THE LEFT HAND INTERCEPT VALVE ON THE TURBINE CAUSING
                              THE SCRUBBER TO COME OFF LINE WITH THE BOILER.

                              THE CLEANING OF THE VENTURI RACE TRACK NOZZLES CAUSED TWO SCRUBBER OUTAGES.

                              THE SCRUBBER WENT OFF LINE SO MAINTENANCE COULD BE DONE ON THE ID FAN
                              DAMPER CONTROLS.

 2/80  SYSTEM     97.0         97.0        97.0        97.0                 696   696    675

       ** PROBLEMS/SOLUTIONS/COMMENTS

                              THE SCRUBBER WAS TAKEN OFF-LINE TWICE DURING FEBRUARY DUE TO A MALFUNCTION
                              OF THE ID FAN CONTROLS.  THE PRESSURE SENSING LINES WERE ALSO CLEANED
                              DURING THE OUTAGE.

                              THE SCRUBBER RACE TRACK NOZZLES HAD TO BE CLEANED TWICE, CAUSING APPROX-
```

NEVADA POWER: REID GARDNER 2 (CONT.)

IMATELY 4 HOURS OUTAGE TIME.

THE DISCHARGE VALVE ON THE VENTURI RECYCLE PUMP WAS REPLACED DURING FEBRUARY.

REPAIRS WERE MADE ON THE SCRUBBER EMERGENCY SPRAY LINE CAUSING ABOUT 4 HOURS OUTAGE TIME.

THE SCRUBBER HAD TO BE SHUT DOWN SO REPAIRS ON THE ID FAN DAMPER CONTROLS COULD BE MADE.

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | SYSTEM | 97.5 | 97.5 | 97.5 | 97.5 | | | 744 | 744 | 725 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE SCRUBBER WAS TAKEN OFF LINE DUE TO NO EMERGENCY SPRAY. DURING THIS TIME MAINTENANCE WAS DONE ON THE A AND B ASH SLUICE PUMPS.

LATER IN THE MONTH AN OUTAGE WAS CAUSED BY A LEAK IN THE EMERGENCY SPRAY LINE.

LOW VENTURI FLOW ALSO WAS A PROBLEM DURING MARCH.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | |
|---|---|
| COMPANY NAME | NEVADA POWER |
| PLANT NAME | REID GARDNER |
| UNIT NUMBER | 3 |
| CITY | MOAPA |
| STATE | NEVADA |
| GROSS UNIT GENERATING CAPACITY - MW | 125.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 110.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 125.0 |

** FUEL DATA

| | | |
|---|---|---|
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 28959. | ( 12450 BTU/LB) |
| AVERAGE ASH CONTENT - % | 8.00 | |
| AVERAGE MOISTURE CONTENT - % | 9.00 | |
| AVERAGE SULFUR CONTENT - % | .50 | |
| AVERAGE CHLORIDE CONTENT - % | .05 | |

** FGD SYSTEM

| | |
|---|---|
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | SODIUM CARBONATE |
| SYSTEM SUPPLIER | ADL/COMBUSTION EQUIP ASSOCIATE |
| NEW/RETROFIT | NEW |
| ENERGY CONSUMPTION - % | ******* |
| INITIAL START-UP DATE | 6/76 |
| COMMERCIAL START-UP DATE | 7/76 |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 85.00 |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 |
| ABSORBER SPARE CAPACITY INDEX - % | .0 |
| ABSORBER SPARE COMPONENTS INDEX | .0 |

** WATER LOOP

| | | |
|---|---|---|
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 9.8 | ( 155 GPM) |

** DISPOSAL

| | |
|---|---|
| TYPE | LINED POND |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | 100.0 | 99.7 | 100.0 | 91.3 | | | 744 | 681 | 679 | |

** PROBLEMS SOLUTIONS/COMMENTS

DURING JANUARY THE SCRUBBER AND BOILER WERE OFF LINE FOR APPROXIMATELY 64 HOURS TO REPAIR AND BALANCE THE BOILER ID FAN.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | SYSTEM | 78.8 | 98.2 | 77.9 | 77.9 | | | 696 | 552 | 542 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY TWO OUTAGES WERE NECESSARY SO THE ID FAN COULD BE BALANCED.

THE SCRUBBER AND BOILER WENT OFF LINE SO THAT THE COAL LEAKS ON THE BURNER LINES COULD BE REPAIRED.

HIGH FURNACE PRESSURE CAUSED THE SCRUBBER AND BOILER TO TRIP OFF.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | SYSTEM | 60.3 | 99.7 | 99.7 | 60.2 | | | 744 | 450 | 448 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND SCRUBBER WENT DOWN TWICE DURING MARCH. THE FIRST OUTAGE WAS TO BALANCE THE ID FAN. LATER IN THE MONTH THE ID FANS AND THE PRECIPITATORS HAD TO BE REPAIRED.

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COMPANY NAME                                   NORTHERN INDIANA PUB SERVICE
PLANT NAME                                     DEAN H. MITCHELL
UNIT NUMBER                                    11
CITY                                           GARY
STATE                                          INDIANA
GROSS UNIT GENERATING CAPACITY - MW              115.0
NET UNIT GENERATING CAPACITY W/FGD - MW           78.0
EQUIVALENT SCRUBBED CAPACITY - MW                115.0

** FUEL DATA
    FUEL TYPE                                  COAL
    FUEL GRADE                                 ******
    AVERAGE HEAT CONTENT - J/G                 25586.        ( 11000 BTU/LB)
    AVERAGE ASH CONTENT - %                    ********
    AVERAGE MOISTURE CONTENT - %                  11.00
    AVERAGE SULFUR CONTENT - %                     3.50
    AVERAGE CHLORIDE CONTENT - %               ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                       WET SCRUBBING
    PROCESS TYPE                               WELLMAN LORD
    SYSTEM SUPPLIER                            DAVY POWERGAS
    NEW/RETROFIT                               RETROFIT
    ENERGY CONSUMPTION - %                        27.8
    INITIAL START-UP DATE                       7/76
    COMMERCIAL START-UP DATE                    6/77
    SO2 DESIGN REMOVAL EFFICIENCY - %             90.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %     98.50
    ABSORBER SPARE CAPACITY INDEX - %               .0
    ABSORBER SPARE COMPONENTS INDEX                 .0

** WATER LOOP
    TYPE                                       CLOSED
    FRESH MAKE-UP WATER - LITER/S              *******       (***** GPM)

** BYPRODUCT
    BYPRODUCT NATURE                           ELEMENTAL SULFUR
    DISPOSITION


-------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

12/79  SYSTEM                                                               744

 1/80  SYSTEM                                                               744

 2/80  SYSTEM                                                               696

 3/80  SYSTEM                                                               744

    ** PROBLEMS/SOLUTIONS/COMMENTS

             NO INFORMATION WAS AVAILABLE FROM DECEMBER 1979 THROUGH MARCH 1980.
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## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | |
|---|---|
| COMPANY NAME | NORTHERN STATES POWER |
| PLANT NAME | SHERBURNE |
| UNIT NUMBER | 1 |
| CITY | BECKER |
| STATE | MINNESOTA |
| GROSS UNIT GENERATING CAPACITY - MW | 740.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 700.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 740.0 |
| ** FUEL DATA | |
| FUEL TYPE | COAL |
| FUEL GRADE | SUBBITUMINOUS |
| AVERAGE HEAT CONTENT - J/G | 19771. ( 8500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 9.00 |
| AVERAGE MOISTURE CONTENT - % | 25.00 |
| AVERAGE SULFUR CONTENT - % | .80 |
| AVERAGE CHLORIDE CONTENT - % | .03 |
| ** FGD SYSTEM | |
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | LIMESTONE/ALKALINE FLYASH |
| SYSTEM SUPPLIER | COMBUSTION ENGINEERING |
| NEW/RETROFIT | NEW |
| ENERGY CONSUMPTION - % | 2.7 |
| INITIAL START-UP DATE | 3/76 |
| COMMERCIAL START-UP DATE | 5/76 |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 50.00 |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 |
| ABSORBER SPARE CAPACITY INDEX - % | 8.0 |
| ABSORBER SPARE COMPONENTS INDEX | .9 |
| ** WATER LOOP | |
| TYPE | CLOSED |
| FRESH MAKE-UP WATER - LITER/S | ******* (***** GPM) |
| ** TREATMENT | |
| TYPE | FORCED OXIDATION |
| ** DISPOSAL | |
| TYPE | LINED POND |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | 97.0 | | | | | | 744 | 793 | | |
| 2/80 | SYSTEM | 97.0 | | | | | | 696 | 687 | | |
| 3/80 | SYSTEM | 98.0 | | | | | | 744 | 688 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, 1980 NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE FGD UNIT.

FROM MID-SEPTEMBER TO MID-OCTOBER THE UTILITY HAS SCHEDULED A BOILER OUTAGE IN WHICH TIME THE MARBLE BEDS WILL BE INSPECTED.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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---------------------------------------------------------------------------------------------

COMPANY NAME                                    NORTHERN STATES POWER
PLANT NAME                                      SHERBURNE
UNIT NUMBER                                     2
CITY                                            BECKER
STATE                                           MINNESOTA
GROSS UNIT GENERATING CAPACITY - MW               740.0
NET UNIT GENERATING CAPACITY W/FGD - MW           700.0
EQUIVALENT SCRUBBED CAPACITY - MW                 740.0

** FUEL DATA
   FUEL TYPE                                    COAL
   FUEL GRADE                                   SUBBITUMINOUS
   AVERAGE HEAT CONTENT - J/G                    19771.         ( 8500 BTU/LB)
   AVERAGE ASH CONTENT - %                           9.00
   AVERAGE MOISTURE CONTENT - %                     25.00
   AVERAGE SULFUR CONTENT - %                        .80
   AVERAGE CHLORIDE CONTENT - %                      .03

** FGD SYSTEM
   GENERAL PROCESS TYPE                         WET SCRUBBING
   PROCESS TYPE                                 LIMESTONE/ALKALINE FLYASH
   SYSTEM SUPPLIER                              COMBUSTION ENGINEERING
   NEW/RETROFIT                                 NEW
   ENERGY CONSUMPTION - %                           2.7
   INITIAL START-UP DATE                         4/77
   COMMERCIAL START-UP DATE                      4/77
   SO2 DESIGN REMOVAL EFFICIENCY - %               50.00
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.00
   ABSORBER SPARE CAPACITY INDEX - %                8.0
   ABSORBER SPARE COMPONENTS INDEX                   .9

** WATER LOOP
   TYPE                                         OPEN
   FRESH MAKE-UP WATER - LITER/S                *******         (***** GPM)

** TREATMENT
   TYPE                                         FORCED OXIDATION

** DISPOSAL
   TYPE                                         LINED POND


--------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ----- ----- ------

1/80   SYSTEM     97.0                                                      744   744

2/80   SYSTEM     96.0                                                      696   696

3/80   SYSTEM     98.0                                                      744   744
```

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, 1980 THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS.

A FOUR WEEK BOILER OUTAGE IS SCHEDULED FOR MAY IN WHICH TIME THE MARBLE BEDS WILL BE REMOVED FROM THE FGD UNIT.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | PACIFIC POWER & LIGHT | |
| PLANT NAME | JIM BRIDGER | |
| UNIT NUMBER | 4 | |
| CITY | ROCK SPRINGS | |
| STATE | WYOMING | |
| GROSS UNIT GENERATING CAPACITY - MW | 550.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 507.8 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 550.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 21632. | ( 9300 BTU/LB) |
| AVERAGE ASH CONTENT - % | 9.00 | |
| AVERAGE MOISTURE CONTENT - % | 18.00 | |
| AVERAGE SULFUR CONTENT - % | .56 | |
| AVERAGE CHLORIDE CONTENT - % | .01 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | SODIUM CARBONATE | |
| SYSTEM SUPPLIER | AIR CORRECTION DIVISION, UOP | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | .2 | |
| INITIAL START-UP DATE | 9/79 | |
| COMMERCIAL START-UP DATE | 2/80 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 91.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 | |
| ABSORBER SPARE COMPONENTS INDEX | .9 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** DISPOSAL | | |
| TYPE | POND | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL | | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS STILL IN THE SHAKEDOWN PHASE. A NUMBER OF MECHANICAL PROBLEMS AND SOME CONTROL PROBLEMS HAVE BEEN ENCOUNTERED.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | PENNSYLVANIA POWER | |
| PLANT NAME | BRUCE MANSFIELD | |
| UNIT NUMBER | 1 | |
| CITY | SHIPPINGPORT | |
| STATE | PENNSYLVANIA | |
| GROSS UNIT GENERATING CAPACITY - MW | 917.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 825.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 917.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 26749. | ( 11500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 12.90 | |
| AVERAGE MOISTURE CONTENT - % | 7.00 | |
| AVERAGE SULFUR CONTENT - % | 3.00 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME | |
| SYSTEM SUPPLIER | CHEMICO | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 6.0 | |
| INITIAL START-UP DATE | 12/75 | |
| COMMERCIAL START-UP DATE | 6/76 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 92.10 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.80 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | CALCILOX | |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | 98.6 | 100.0 | | 90.4 | | | 744 | 672 | 672 | |
| 2/80 | SYSTEM | 98.1 | 100.0 | | 93.7 | | | 696 | 652 | 652 | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS OCCURRED DURING JANUARY AND FEBRUARY.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | SYSTEM | 98.8 | 100.0 | | 83.7 | | | 744 | 623 | 623 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT ONE WEEK IN MARCH DUE TO A PLUGGED AIR PREHEATER. NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FOR MARCH.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | PENNSYLVANIA POWER | |
| PLANT NAME | BRUCE MANSFIELD | |
| UNIT NUMBER | 2 | |
| CITY | SHIPPINGPORT | |
| STATE | PENNSYLVANIA | |
| GROSS UNIT GENERATING CAPACITY - MW | 917.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 825.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 917.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 26749. | ( 11500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 12.90 | |
| AVERAGE MOISTURE CONTENT - % | 7.00 | |
| AVERAGE SULFUR CONTENT - % | 3.00 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME | |
| SYSTEM SUPPLIER | CHEMICO | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 6.0 | |
| INITIAL START-UP DATE | 7/77 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 92.10 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.80 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | CALCILOX | |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | 97.1 | 100.0 | | 90.6 | | | 744 | 674 | 674 | |
| 2/80 | SYSTEM | 94.7 | 100.0 | | 99.8 | | | 696 | 694 | 694 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS DURING JANUARY AND FEBRUARY.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | SYSTEM | 98.4 | 100.0 | | 83.7 | | | 744 | 380 | 380 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT 16 DAYS IN MARCH FOR A SCHEDULED BOILER INSPECTION. NO MAJOR FGD RELATED PROBLEMS WERE REPORTED.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | PHILADELPHIA ELECTRIC | |
| PLANT NAME | EDDYSTONE | |
| UNIT NUMBER | 1A | |
| CITY | EDDYSTONE | |
| STATE | PENNSYLVANIA | |
| GROSS UNIT GENERATING CAPACITY - MW | 120.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 120.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 120.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 31634. | ( 13600 BTU/LB) |
| AVERAGE ASH CONTENT - % | 9.40 | |
| AVERAGE MOISTURE CONTENT - % | 5.90 | |
| AVERAGE SULFUR CONTENT - % | 2.60 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | MAGNESIUM OXIDE | |
| SYSTEM SUPPLIER | UNITED ENGINEERS | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 9/75 | |
| COMMERCIAL START-UP DATE | 9/75 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 90.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.00 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 8.3 | ( 132 GPM) |
| ** BYPRODUCT | | |
| BYPRODUCT NATURE | SULFURIC ACID | |
| DISPOSITION | | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | 0 | | |
| 2/80 | SYSTEM | | | | | | | 696 | 0 | | |
| 3/80 | SYSTEM | | | | | | | 744 | 0 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND TURBINE WERE DOWN DURING THE FIRST QUARTER 1980 FOR TURBINE MAINTENANCE.

OPERATION OF THIS PROTOTYPE MAGNESIUM OXIDE SYSTEM, WHICH TREATED ONE THIRD OF THE FLUE GAS FROM THE EDDYSTONE 1 BOILER, HAS BEEN TERMINATED. THE SO2 REMOVAL EQUIPMENT IS PRESENTLY BEING REPLACED WITH A SIMILAR MAG-OX SYSTEM DESIGNED TO TREAT 100% OF THE BOILER FLUE GAS. THE EXPECTED START DATE OF THIS SYSTEM IS DECEMBER 1982. CURRENT REGULATIONS DO NOT REQUIRE CONTROL OF SO2 EMISSIONS UNTIL THE NEW SCRUBBER IS AVAILABLE FOR OPERATION.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | |
|---|---|
| COMPANY NAME | PUBLIC SERVICE OF NEW MEXICO |
| PLANT NAME | SAN JUAN |
| UNIT NUMBER | 1 |
| CITY | WATERFLOW |
| STATE | NEW MEXICO |
| GROSS UNIT GENERATING CAPACITY - MW | 361.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 314.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 361.0 |
| ** FUEL DATA | |
| FUEL TYPE | COAL |
| FUEL GRADE | SUBBITUMINOUS |
| AVERAGE HEAT CONTENT - J/G | 22795. ( 9800 BTU/LB) |
| AVERAGE ASH CONTENT - % | 18.30 |
| AVERAGE MOISTURE CONTENT - % | 14.82 |
| AVERAGE SULFUR CONTENT - % | .80 |
| AVERAGE CHLORIDE CONTENT - % | .03 |
| ** FGD SYSTEM | |
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | WELLMAN LORD |
| SYSTEM SUPPLIER | DAVY POWERGAS |
| NEW/RETROFIT | RETROFIT |
| ENERGY CONSUMPTION - % | 4.4 |
| INITIAL START-UP DATE | 4/78 |
| COMMERCIAL START-UP DATE | **/** |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 90.00 |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.80 |
| ABSORBER SPARE CAPACITY INDEX - % | 33.0 |
| ABSORBER SPARE COMPONENTS INDEX | 1.0 |
| ** WATER LOOP | |
| TYPE | CLOSED |
| FRESH MAKE-UP WATER - LITER/S | 30.2 ( 480 GPM) |
| ** BYPRODUCT | |
| BYPRODUCT NATURE | ELEMENTAL SULFUR |
| DISPOSITION | MARKETED |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | A | 81.0 | 51.0 | | 42.0 | | | | | | |
| | B | 96.0 | 42.0 | | 35.0 | | | | | | |
| | C | .0 | .0 | | .0 | | | | | | |
| | D | 83.0 | 79.0 | | 65.0 | | | | | | |
| | SYSTEM | 87.0 | 57.0 | | 47.0 | | | 744 | 610 | 351 | |
| 2/80 | A | .0 | .0 | | .0 | | | | | | |
| | B | 99.0 | 94.0 | | 86.0 | | | | | | |
| | C | 3.0 | 3.0 | | 2.0 | | | | | | |
| | D | 99.0 | 98.0 | | 89.0 | | | | | | |
| | SYSTEM | 67.0 | 65.0 | | 59.0 | | | 696 | 634 | 411 | |
| 3/80 | A | .0 | .0 | | .0 | | | | | | |
| | B | 100.0 | 50.0 | | 18.0 | | | | | | |
| | C | 83.0 | 83.0 | | 29.0 | | | | | | |
| | D | 97.0 | 85.0 | | 30.0 | | | | | | |
| | SYSTEM | 93.0 | 73.0 | | 26.0 | | | 744 | 262 | 191 | |

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER OPERATIONS AT UNIT ONE ARE STILL LIMITED TO TWO MODULES BECAUSE OF A LACK OF REHEAT.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | PUBLIC SERVICE OF NEW MEXICO | |
| PLANT NAME | SAN JUAN | |
| UNIT NUMBER | 2 | |
| CITY | WATERFLOW | |
| STATE | NEW MEXICO | |
| GROSS UNIT GENERATING CAPACITY - MW | 350.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 316.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 350.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 22795. | ( 9800 BTU/LB) |
| AVERAGE ASH CONTENT - % | 18.00 | |
| AVERAGE MOISTURE CONTENT - % | 14.82 | |
| AVERAGE SULFUR CONTENT - % | .80 | |
| AVERAGE CHLORIDE CONTENT - % | .03 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | WELLMAN LORD | |
| SYSTEM SUPPLIER | DAVY POWERGAS | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 4.6 | |
| INITIAL START-UP DATE | 8/78 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 90.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.50 | |
| ABSORBER SPARE CAPACITY INDEX - % | 33.0 | |
| ABSORBER SPARE COMPONENTS INDEX | 1.0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 30.2 | ( 480 GPM) |
| ** BYPRODUCT | | |
| BYPRODUCT NATURE | ELEMENTAL SULFUR | |
| DISPOSITION | MARKETED | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | E | 92.0 | 63.0 | | 62.0 | | | | | | |
| | F | .0 | .0 | | .0 | | | | | | |
| | G | .0 | .0 | | .0 | | | | | | |
| | H | .0 | .0 | | .0 | | | | | | |
| | SYSTEM | 31.0 | 21.0 | | 21.0 | | | 744 | 737 | 155 | |
| 2/80 | E | 97.0 | 66.0 | | 65.0 | | | | | | |
| | F | 22.0 | 2.0 | | 12.0 | | | | | | |
| | G | .0 | .0 | | .0 | | | | | | |
| | H | .0 | .0 | | .0 | | | | | | |
| | SYSTEM | 40.0 | 23.0 | | 26.0 | | | 696 | 683 | 178 | |
| 3/80 | E | 87.0 | .0 | | .0 | | | | | | |
| | F | 85.0 | 94.0 | | 59.0 | | | | | | |
| | G | .0 | .0 | | .0 | | | | | | |
| | H | .0 | .0 | | .0 | | | | | | |
| | SYSTEM | 57.0 | 31.0 | | 20.0 | | | 744 | 472 | 147 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER ONLY ONE ABSORBER COULD BE OPERATED DUE TO AN ELECTRICAL PROBLEM. CURRENTLY, OPERATIONS ARE LIMITED TO TWO ABSORBERS UNTIL REHEAT IS INSTALLED, WHICH IS EXPECTED TO BE COMPLETED IN APRIL.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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------------------------------------------------------------------------------------------------------

 COMPANY NAME                                     PUBLIC SERVICE OF NEW MEXICO
 PLANT NAME                                       SAN JUAN
 UNIT NUMBER                                      3
 CITY                                             WATERFLOW
 STATE                                            NEW MEXICO
 GROSS UNIT GENERATING CAPACITY - MW                534.0
 NET UNIT GENERATING CAPACITY W/FGD - MW            468.0
 EQUIVALENT SCRUBBED CAPACITY - MW                  534.0

 ** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   SUBBITUMINOUS
     AVERAGE HEAT CONTENT - J/G                    15841.        ( 6810 BTU/LB)
     AVERAGE ASH CONTENT - %                          22.45
     AVERAGE MOISTURE CONTENT - %                     14.82
     AVERAGE SULFUR CONTENT - %                         .80
     AVERAGE CHLORIDE CONTENT - %                       .07

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                         WET SCRUBBING
     PROCESS TYPE                                 WELLMAN LORD
     SYSTEM SUPPLIER                              DAVY POWERGAS
     NEW/RETROFIT                                 NEW
     ENERGY CONSUMPTION - %                           3.6
     INITIAL START-UP DATE                        12/79
     COMMERCIAL START-UP DATE                     **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %               90.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.50
     ABSORBER SPARE CAPACITY INDEX - %                2.5
     ABSORBER SPARE COMPONENTS INDEX                  1.0

 ** BYPRODUCT
     BYPRODUCT NATURE                             SULFURIC ACID
     DISPOSITION                                  MARKETED


------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                               SO2  PART.  HOURS HOURS  HOURS  FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ -----  ------

 1/80   M          86.0        54.0                   42.0
        SYSTEM                                                                744   568

 2/80   M          98.0        14.0                    1.0
        SYSTEM                                                                696    44

 3/80   M                      80.0                   63.0
        SYSTEM                                                                744   547

     ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE ONE MODULE CURRENTLY OPERATIONAL AT SAN JUAN 3 OPERATED WITHOUT ANY
                         MAJOR PROBLEMS DURING THE FIRST QUARTER.  THE BOILER WAS OFF LINE FOR
                         3-4 WEEKS IN FEBRUARY DUE TO AN ELECTRICAL PROBLEM.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | SALT RIVER PROJECT | |
| PLANT NAME | CORONADO | |
| UNIT NUMBER | 1 | |
| CITY | ST. JOHNS | |
| STATE | ARIZONA | |
| GROSS UNIT GENERATING CAPACITY - MW | 350.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 350.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 280.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 19306. | ( 8300 BTU/LB) |
| AVERAGE ASH CONTENT - % | 25.00 | |
| AVERAGE MOISTURE CONTENT - % | 16.00 | |
| AVERAGE SULFUR CONTENT - % | 1.00 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | PULLMAN KELLOGG | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 4.3 | |
| INITIAL START-UP DATE | 11/79 | |
| COMMERCIAL START-UP DATE | 12/79 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 82.50 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.87 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 17.0 | ( 270 GPM) |
| ** DISPOSAL | | |
| TYPE | LINED POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD THE STACK EMISSION TESTS WERE COMPLETED. NO OPERATIONAL INFORMATION WAS AVAILABLE.

```
                                   SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
---------------------------------------------------------------------------------------------------------

 COMPANY NAME                                       SOUTH CAROLINA PUBLIC SERVICE
 PLANT NAME                                         WINYAH
 UNIT NUMBER                                        2
 CITY                                               GEORGETOWN
 STATE                                              SOUTH CAROLINA
 GROSS UNIT GENERATING CAPACITY - MW                  280.0
 NET UNIT GENERATING CAPACITY W/FGD - MW              259.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    140.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                      26749.          ( 11500 BTU/LB)
     AVERAGE ASH CONTENT - %                            13.50
     AVERAGE MOISTURE CONTENT - %                   ********
     AVERAGE SULFUR CONTENT - %                          1.70
     AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   LIMESTONE
     SYSTEM SUPPLIER                                BABCOCK & WILCOX
     NEW/RETROFIT                                   NEW
     ENERGY CONSUMPTION - %                              1.1
     INITIAL START-UP DATE                           7/77
     COMMERCIAL START-UP DATE                       **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                 69.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.40
     ABSORBER SPARE CAPACITY INDEX - %                    .0
     ABSORBER SPARE COMPONENTS INDEX                      .0

 ** WATER LOOP
     TYPE                                           OPEN
     FRESH MAKE-UP WATER - LITER/S                       6.3         (  100 GPM)

 ** DISPOSAL
     TYPE                                           POND


-------------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                                                                744

 2/80  SYSTEM                                                                696

 3/80  SYSTEM                                                                744

         ** PROBLEMS/SOLUTIONS/COMMENTS

                      DURING THE FIRST QUARTER 1980 THE UNIT OPERATED WITH NO MAJOR PROBLEMS.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | SOUTH MISSISSIPPI ELEC PWR | |
| PLANT NAME | R.D. MORROW | |
| UNIT NUMBER | 1 | |
| CITY | HATTISBURG | |
| STATE | MISSISSIPPI | |
| GROSS UNIT GENERATING CAPACITY - MW | 200.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 180.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 124.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 27912. | ( 12000 BTU/LB) |
| AVERAGE ASH CONTENT - % | 15.00 | |
| AVERAGE MOISTURE CONTENT - % | 6.50 | |
| AVERAGE SULFUR CONTENT - % | 1.30 | |
| AVERAGE CHLORIDE CONTENT - % | .01 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | RILEY STOKER/ENVIRONEERING | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 5.5 | |
| INITIAL START-UP DATE | 8/78 | |
| COMMERCIAL START-UP DATE | 8/78 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 85.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.60 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | FLYASH STABILIZATION | |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | .0 | | .0 | .0 | | | 740 | 0 | 0 | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF LINE DURING JANUARY DUE TO THE FAILURE OF THE LININGS.

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR FEBRUARY AND MARCH.

```
                                             SECTION 3
                      DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
------------------------------------------------------------------------------------------------------

 COMPANY NAME                                     SOUTH MISSISSIPPI ELEC PWR
 PLANT NAME                                       R.D. MORROW
 UNIT NUMBER                                      2
 CITY                                             HATTISBURG
 STATE                                            MISSISSIPPI
 GROSS UNIT GENERATING CAPACITY - MW                200.0
 NET UNIT GENERATING CAPACITY W/FGD - MW            180.0
 EQUIVALENT SCRUBBED CAPACITY - MW                  124.0

 ** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                    27912.          ( 12000 BTU/LB)
     AVERAGE ASH CONTENT - %                          15.00
     AVERAGE MOISTURE CONTENT - %                      6.50
     AVERAGE SULFUR CONTENT - %                        1.30
     AVERAGE CHLORIDE CONTENT - %                       .01

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                         WET SCRUBBING
     PROCESS TYPE                                 LIMESTONE
     SYSTEM SUPPLIER                              RILEY STOKER/ENVIRONEERING
     NEW/RETROFIT                                 NEW
     ENERGY CONSUMPTION - %                           5.5
     INITIAL START-UP DATE                        6/79
     COMMERCIAL START-UP DATE                     6/79
     SO2 DESIGN REMOVAL EFFICIENCY - %               85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.60
     ABSORBER SPARE COMPONENTS INDEX                   .0

 ** WATER LOOP
     TYPE                                         CLOSED
     FRESH MAKE-UP WATER - LITER/S                *******         (***** GPM)

 ** TREATMENT
     TYPE                                         FLYASH STABILIZATION

 ** DISPOSAL
     TYPE                                         LANDFILL


----------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL     PER BOILER   FGD  CAP.
                                                               SO2   PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM        .0                       .0          .0                744  698       0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                            THE UNIT REMAINED OFF LINE DURING JANUARY DUE TO THE FAILURE OF THE
                            LININGS.

 2/80  SYSTEM                                                                   696

 3/80  SYSTEM                                                                   744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                            NO INFORMATION WAS AVAILABLE FOR FEBRUARY AND MARCH.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | SOUTHERN ILLINOIS POWER COOP | |
| PLANT NAME | MARION | |
| UNIT NUMBER | 4 | |
| CITY | MARION | |
| STATE | ILLINOIS | |
| GROSS UNIT GENERATING CAPACITY - MW | 184.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 160.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 184.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL/REFUSE | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 20934. | ( 9000 BTU/LB) |
| AVERAGE ASH CONTENT - % | 16.00 | |
| AVERAGE MOISTURE CONTENT - % | 10.00 | |
| AVERAGE SULFUR CONTENT - % | 3.50 | |
| AVERAGE CHLORIDE CONTENT - % | .10 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | BABCOCK & WILCOX | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 5/79 | |
| COMMERCIAL START-UP DATE | 5/79 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 89.40 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.60 | |
| ABSORBER SPARE CAPACITY INDEX - % | ******* | |
| ABSORBER SPARE COMPONENTS INDEX | ******* | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |
| ** TREATMENT | | |
| TYPE | FLYASH STABILIZATION | |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | | | | .0 | | | 744 | 0 | 0 | |
| 11/79 | SYSTEM | | 100.0 | | 26.7 | | | 720 | 192 | 192 | |
| 12/79 | SYSTEM | | 100.0 | | 71.0 | | | 744 | 528 | 528 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FROM OCTOBER 1 THROUGH NOVEMBER 17 FOR A BOILER/TURBINE INSPECTION. NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1979 OTHER THAN SOME FREEZE-UPS CAUSED BY THE WINTER WEATHER.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | 100.0 | | 10.0 | | | 744 | 72 | 72 | |
| 2/80 | SYSTEM | | 100.0 | | 31.0 | | | 696 | 216 | 216 | |
| 3/80 | SYSTEM | | 100.0 | | 48.4 | | | 744 | 360 | 360 | |

```
-------------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------
```

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE LOW BOILER AND SCRUBBER HOURS WERE A RESULT OF AN EIGHTEEN DAY BOILER OUTAGE NEEDED FOR CORRECTION OF TUBE PROBLEMS. BOILER OUTAGES DUE TO TUBE PROBLEMS WERE ALSO EXPERIENCED IN FEBRUARY AND MARCH.

THE ONLY REPORTED FGD RELATED PROBLEM DURING THE FIRST QUARTER 1980 WAS KEEPING THE BELT IN THE SLUDGE DISPOSAL SYSTEM PROPERLY ALIGNED.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

```
-------------------------------------------------------------------------------------------------------------

COMPANY NAME                                        SOUTHERN INDIANA GAS & ELEC
PLANT NAME                                          A.B. BROWN
UNIT NUMBER                                         1
CITY                                                WEST FRANKLIN
STATE                                               INDIANA
GROSS UNIT GENERATING CAPACITY - MW                   265.0
NET UNIT GENERATING CAPACITY W/FGD - MW               250.0
EQUIVALENT SCRUBBED CAPACITY - MW                     265.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       25819.        ( 11100 BTU/LB)
    AVERAGE ASH CONTENT - %                             9.40
    AVERAGE MOISTURE CONTENT - %                       13.30
    AVERAGE SULFUR CONTENT - %                          3.35
    AVERAGE CHLORIDE CONTENT - %                         .05

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    DUAL ALKALI
    SYSTEM SUPPLIER                                 FMC
    NEW/RETROFIT                                    NEW
    ENERGY CONSUMPTION - %                               .8
    INITIAL START-UP DATE                            4/79
    COMMERCIAL START-UP DATE                         4/79
    SO2 DESIGN REMOVAL EFFICIENCY - %                  85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.50
    ABSORBER SPARE CAPACITY INDEX - %                  20.0
    ABSORBER SPARE COMPONENTS INDEX                      .3

** WATER LOOP
    TYPE                                            CLOSED
    FRESH MAKE-UP WATER - LITER/S                   *******        (***** GPM)

** TREATMENT
    TYPE                                            NONE

** DISPOSAL
    TYPE                                            LANDFILL


-------------------------------------------PERFORMANCE DATA-------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

1/80   A          99.0        96.5                     96.5
       B          99.0        99.0                     99.0
       SYSTEM     99.0        98.0        98.0         98.0                    744   744    727

       ** PROBLEMS/SOLUTIONS/COMMENTS

                       THE 7 HOURS OF FORCED OUTAGE TIME DURING JANUARY WERE DUE TO A THICKENER
                       RAKE STALL.

2/80   A          99.1        70.3                     69.4
       B          98.4        70.0                     68.7
       SYSTEM     99.0        70.0        70.0         69.0                    696   687    481

       ** PROBLEMS/SOLUTIONS/COMMENTS

                       SOME OUTAGE TIME IS FEBRUARY WAS DUE TO A WET SLUDGE PRODUCT CAUSED BY
                       A CHEMICAL IMBALANCE.

3/80   A          43.8        44.4                     26.5
       B          38.4        35.4                     21.1
       SYSTEM     45.0        65.0        68.0         27.0                    744   304    177
```

```
-------------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
------ ------ ------------ ----------- ----------- ----------- SO2  PART. HOURS HOURS  HOURS FACTOR
                                                                ----- ----- ----- ------ ----- ------

        ** PROBLEMS/SOLUTIONS/COMMENTS

                                      DURING MARCH, DOWN TIME WAS DUE TO A SCHEDULED UNIT OUTAGE, DURING WHICH
                                      TIME MAINTENANCE WAS PERFORMED ON THE SCRUBBER.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | SPRINGFIELD CITY UTILITIES | |
| PLANT NAME | SOUTHWEST | |
| UNIT NUMBER | 1 | |
| CITY | SPRINGFIELD | |
| STATE | MISSOURI | |
| GROSS UNIT GENERATING CAPACITY - MW | 194.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 173.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 194.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 29075. | ( 12500 BTU/LB) |
| AVERAGE ASH CONTENT - % | 13.00 | |
| AVERAGE MOISTURE CONTENT - % | ******** | |
| AVERAGE SULFUR CONTENT - % | 3.50 | |
| AVERAGE CHLORIDE CONTENT - % | .30 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | AIR CORRECTION DIVISION, UOP | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 4.6 | |
| INITIAL START-UP DATE | 4/77 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 80.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.70 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 19.8 | ( 315 GPM) |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | S-1 | 24.4 | 38.6 | 47.9 | 36.3 | | | | | | |
| | S-2 | 68.7 | 72.5 | 73.0 | 68.0 | | | | | | |
| | SYSTEM | 61.5 | 55.6 | 61.5 | 52.2 | | | 744 | 698 | 388 | |

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE BEGINNING OF JANUARY THE ID FAN EXPANSION JOINT BROKE FOLLOWED BY THE UNIT COMING OFF LINE.

DURING THE LATER PART OF THIS PERIOD THE DEMISTER AND TRAP OUT TRAY HEADER FROZE. AFTER REPAIRS WERE MADE BOTH MODULES WERE PUT ON LINE. BOTH WERE KEPT RUNNING UNTIL THE 20TH WHEN A FLANGE BROKE LOOSE ON THE DEMISTER HEADER.

AFTER THE REPAIRS WERE COMPLETED THE MODULE OPERATED UNTIL THE 27TH WHEN FREEZING AIR LINES TO THE BALL MILLS PREVENTED THE USE OF BOTH MODULES DUE TO THE LACK OF SLURRY.

THE UNIT WAS ON LINE AT THE BEGINNING OF THE MONTH BUT DEVELOPED PRESATURATOR SPRAY NOZZLE PROBLEMS. WHILE THIS WAS BEING REPAIRED THE UNIT WAS TAKEN OFF LINE. APART FROM THIS TIME THE MODULE WAS ON LINE.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | S-1 | 36.6 | 29.1 | 29.0 | 29.0 | | | | | | |
| | S-2 | 73.9 | 71.7 | 71.6 | 71.6 | | | | | | |
| | SYSTEM | 55.3 | 50.4 | 50.4 | 50.3 | | | 696 | 695 | 350 | |

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE S-1 MODULE WAS OUT OF SERVICE IN THE FIRST PART OF FEBRUARY DUE TO
                          FROZEN AND BROKEN LINES.  THE SUPERNATE LINE BROKE IN SEVERAL PLACES TAKING
                          BOTH MODULES OUT OF SERVICE FOR SEVERAL DAYS.  ONCE THIS WAS REPAIRED BOTH
                          MODULES WERE IN SERVICE AS REQUIRED BY LOAD EXCEPT FOR A FEW MINOR TRIPS.

                          THE S-2 MODULE WAS EITHER IN SERVICE OR AVAILABLE FOR MOST OF THE MONTH.

3/80   S-1         64.5         64.1        64.1        64.1
       S-2         22.0          5.8         5.8         5.8
       SYSTEM      43.3         34.9        34.9        34.9                     744   744    260

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          DURING MARCH THE S-1 MODULE WAS OUT FOR 11 DAYS TO CLEAN THE ABSORBER
                          SECTION.

                          THE S-2 MODULE WAS OUT OF SERVICE FOR CLEANING THE ABSORBER SECTIONS AND
                          DEMISTERS FOR NEARLY ALL THE PERIOD BUT WAS AVAILABLE ON THE 25TH.
                          IT WAS NOT RUN, HOWEVER, DUE TO LOW UNIT LOADS.
```

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--------------------------------------------------------------------------------------------------------------

COMPANY NAME                                  ST. JOE ZINC
PLANT NAME                                    G.F. WEATON
UNIT NUMBER                                   1
CITY                                          MONACA
STATE                                         PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW              60.0
NET UNIT GENERATING CAPACITY W/FGD - MW          60.0
EQUIVALENT SCRUBBED CAPACITY - MW                60.0

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 29075.          ( 12500 BTU/LB)
    AVERAGE ASH CONTENT - %                       11.50
    AVERAGE MOISTURE CONTENT - %              ********
    AVERAGE SULFUR CONTENT - %                     2.00
    AVERAGE CHLORIDE CONTENT - %                    .20

** FGD SYSTEM
    GENERAL PROCESS TYPE                      WET SCRUBBING
    PROCESS TYPE                              CITRATE
    SYSTEM SUPPLIER                           BUREAU OF MINES
    NEW/RETROFIT                              RETROFIT
    ENERGY CONSUMPTION - %                    *******
    INITIAL START-UP DATE                     11/79
    COMMERCIAL START-UP DATE                   1/80
    SO2 DESIGN REMOVAL EFFICIENCY - %             90.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %     99.60
    ABSORBER SPARE CAPACITY INDEX - %               .0
    ABSORBER SPARE COMPONENTS INDEX                 .0

** WATER LOOP
    TYPE                                      CLOSED
    FRESH MAKE-UP WATER - LITER/S             *******          (***** GPM)

** BYPRODUCT
    BYPRODUCT NATURE                          ELEMENTAL SULFUR
    DISPOSITION


------------------------------------------PERFORMANCE DATA----------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                                                                744

 2/80  SYSTEM                                                                696

 3/80  SYSTEM                                                                744

      ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE SYSTEM IS STILL GOING THROUGH THE DEBUGGING PHASE OF OPERATION.  SOME
                         EQUIPMENT PROBLEMS HAVE OCCURRED, ESPECIALLY WITH THE HYDROGEN SULFITE
                         GENERATOR EQUIPMENT.  ANOTHER MAJOR PROBLEM AREA HAS BEEN THE HEAT EX-
                         CHANGERS, ONE OF WHICH HAD TO BE REMOVED AND SENT BACK.  120 HOURS OF
                         OPERATION WERE LOGGED DURING THE FIRST QUARTER 1980 BRINGING THE TOTAL
                         SYSTEM HOURS OF OPERATION TO 164.
```

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                                    SECTION 3
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
----------------------------------------------------------------------------------------------

 COMPANY NAME                                       TENNESSEE VALLEY AUTHORITY
 PLANT NAME                                         SHAWNEE
 UNIT NUMBER                                        10A
 CITY                                               PADUCAH
 STATE                                              KENTUCKY
 GROSS UNIT GENERATING CAPACITY - MW                  10.0
 NET UNIT GENERATING CAPACITY W/FGD - MW              10.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    10.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                     *******        (****** BTU/LB)
     AVERAGE ASH CONTENT - %                        ********
     AVERAGE MOISTURE CONTENT - %                   ********
     AVERAGE SULFUR CONTENT - %                         2.90
     AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   LIME/LIMESTONE
     SYSTEM SUPPLIER                                AIR CORRECTION DIVISION, UOP
     NEW/RETROFIT                                   RETROFIT
     ENERGY CONSUMPTION - %                         *******
     INITIAL START-UP DATE                          4/72
     COMMERCIAL START-UP DATE                       **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %              ********
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %      ********
     ABSORBER SPARE COMPONENTS INDEX                      .0

 ** WATER LOOP
     TYPE                                           CLOSED
     FRESH MAKE-UP WATER - LITER/S                  *******        (***** GPM)


---------------------------------------PERFORMANCE DATA---------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ---- ----- ----- ------ ----- ------

3/80   SYSTEM

     ** PROBLEMS/SOLUTIONS/COMMENTS

                   REFER TO THE PERFORMANCE UPDATE INFORMATION FOR SHAWNEE 10B.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | TENNESSEE VALLEY AUTHORITY | |
| PLANT NAME | SHAWNEE | |
| UNIT NUMBER | 10B | |
| CITY | PADUCAH | |
| STATE | KENTUCKY | |
| GROSS UNIT GENERATING CAPACITY - MW | 10.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 10.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 10.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | BITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | ******* | (****** BTU/LB) |
| AVERAGE ASH CONTENT - % | ******** | |
| AVERAGE MOISTURE CONTENT - % | ******** | |
| AVERAGE SULFUR CONTENT - % | 2.90 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIME/LIMESTONE | |
| SYSTEM SUPPLIER | CHEMICO | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 4/72 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | ******** | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | ******** | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | ******* | (***** GPM) |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980, ONLY THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED. THE TCA SYSTEM CONTINUED TO OPERATE DURING THE QUARTER ON DOWA BASIC ALUMINUM SULFATE PROCESS UNDER EPRI/UOP/TVA SPONSORSHIP.

THE LIMESTONE/ADIPIC ACID TEST SERIES ON THE VENTURI/SPRAY TOWER SYSTEM, WHICH HAD BEEN INITIATED IN MID-DECEMBER TO INVESTIGATE THE RELATIONSHIP BETWEEN THE SLURRY PH AND THE ADIPIC ACID CONSUMPTION (DEGRADATION) RATE, WAS COMPLETED IN MID-FEBRUARY. THE TESTS WERE CONDUCTED WITHOUT FORCED OXIDATION AND WITH A SINGLE HOLD TANK. AT THE SCRUBBER INLET PH OF 4.6 TO 5.0, ESSENTIALLY ALL OF THE ADIPIC ACID ADDED WAS ACCOUNTED FOR IN THE LIQUID PHASE OF THE WASTE SLUDGE DISCHARGED FROM THE SYSTEM. AT THE SCRUBBER INLET PH 5.25 AND 5.5, THE ADIPIC ACID UNACCOUNTED FOR WERE 6 PERCENT AND 26 PERCENT, RESPECTIVELY. THEREFORE, IT APPEARS THAT THE ADIPIC ACID (OR CARBOXYLIC ACID) DEGRADATION TAKES PLACE AT SCRUBBER INLET PH ABOVE ABOUT 5.1 UNDER CONDITIONS ASKED.

A SERIES OF LIMESTONE/ADIPIC ACID TESTS WERE CONDUCTED FROM MID-FEBRUARY TO EARLY MARCH USING THE VENTURI SCRUBBER ONLY WITH A SINGLE TANK AND WITHOUT FORCED OXIDATION TO INVESTIGATE THE SO2 REMOVAL CAPABILITY OF THE VENTURI AT 5.1 INLET PH AND HIGH ADIPIC ACID CONCENTRATION. AT 4000 PPM ADIPIC ACID, L/G OF 21 GAL/MCF, AND 8.3 INCHES H2O PRESSURE DROP, SO2 REMOVAL WAS 65 PERCENT WITH 2200 PPM INLET SO2 CONCENTRATION.

FORCED OXIDATION USING A SINGLE TANK WITH LIMESTONE/ADIPIC ACID SLURRY ON

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EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)


---------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ---- ----- ----- ------ ----- ------
                                THE VENTURI/SPRAY TOWER SYSTEM BEGAN IN MID-MARCH.  AS IN THE CORRESPONDING
                                TEST SERIES CONDUCTED ON TCA IN APRIL 1979, LIMESTONE BLINDING BY CALCIUM
                                SULFITE OCCURRED.  SOLUTION OF THE PROBLEM CAN BE EXPECTED BY USING TWO
                                TANKS IN SERIES WITH FORCED OXIDATION IN THE FIRST TANK AND LIMESTONE
                                ADDITION IN THE SECOND.  THIS MODE IS PLANNED ON BEING DEMONSTRATED NEXT
                                QUARTER.
```

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | TENNESSEE VALLEY AUTHORITY | |
| PLANT NAME | WIDOWS CREEK | |
| UNIT NUMBER | 8 | |
| CITY | BRIDGEPORT | |
| STATE | ALABAMA | |
| GROSS UNIT GENERATING CAPACITY - MW | 550.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 516.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 550.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 23260. | ( 10000 BTU/LB) |
| AVERAGE ASH CONTENT - % | 25.00 | |
| AVERAGE MOISTURE CONTENT - % | 10.00 | |
| AVERAGE SULFUR CONTENT - % | 3.70 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | TENNESSEE VALLEY AUTHORITY | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 4.7 | |
| INITIAL START-UP DATE | 5/77 | |
| COMMERCIAL START-UP DATE | 1/78 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 80.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.50 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** DISPOSAL | | |
| TYPE | POND | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | A | 70.4 | 79.8 | | 39.2 | | | | | | |
| | B | 83.5 | 100.0 | | 56.3 | | | | | | |
| | C | 100.0 | 100.0 | | 55.5 | | | | | | |
| | D | 28.3 | 54.6 | | 26.9 | | | | | | |
| | SYSTEM | 70.6 | 90.4 | | 44.5 | 83.60 | | 744 | 366 | 331 | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE UNIT 8 BOILER EXPERIENCED LOW AVAILABILITY, CAUSING THE FORCED OXIDATION TESTS TO BE DISCONTINUED UNTIL AFTER THE SCHEDULED MAINTENANCE OUTAGE WHICH WILL BEGIN IN SEPTEMBER 1980. THE FORCED OXIDATION TESTS ARE EXPECTED TO RESUME IN JANUARY 1981.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/80 | A | 80.0 | 88.6 | | 72.7 | | | | | | |
| | B | 86.1 | 90.2 | | 74.0 | | | | | | |
| | C | 90.7 | 97.5 | | 80.0 | | | | | | |
| | D | 87.2 | 98.2 | | 80.6 | | | | | | |
| | SYSTEM | 85.9 | 93.7 | | 76.5 | 84.00 | | 696 | 571 | 535 | |

** PROBLEMS/SOLUTIONS/COMMENTS

BY FEBRUARY 27, 1980, THE DIFFERENTIAL PRESSURE ACROSS TRAIN "C" ABSORBER HAD REACHED 19 INCHES WATER GAGE. THE HIGH ABSORBER DIFFERENTIAL PRESSURE WAS CAUSED BY PLUGGAGE OF TURBULENT CONTACT ABSORBER (TCA) SPHERES WHICH WERE INSTALLED DURING SCRUBBER OPTIMIZATION TESTS. THE TCA SPHERES WILL BE REMOVED IN MARCH.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/80 | A | 93.5 | 88.0 | | 85.3 | | | | | | |

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | 93.0 | 90.6 | | 87.9 | | | | | | |
| | C | 71.9 | 73.3 | | 71.1 | | | | | | |
| | D | 93.3 | 63.9 | | 61.9 | | | | | | |
| | SYSTEM | 87.9 | 78.9 | | 76.6 | 82.60 | | 744 | 722 | 570 | |

** PROBLEMS/SOLUTIONS/COMMENTS

ON MARCH 3 THE TCA SPHERES INSTALLED IN TRAIN C AS PART OF THE OPTIMIZATION TESTS WERE REMOVED. THE SPHERES HAD BECOME PLUGGED, RESULTING IN AN ABSORBER DIFFERENTIAL PRESSURE OF 20 INCHES WATER GAGE. THE SPHERES HAD BEEN IN USE SINCE NOVEMBER 17, 1979.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | TEXAS UTILITIES | |
| PLANT NAME | MARTIN LAKE | |
| UNIT NUMBER | 1 | |
| CITY | TATUM | |
| STATE | TEXAS | |
| GROSS UNIT GENERATING CAPACITY - MW | 793.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 750.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 595.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | LIGNITE | |
| AVERAGE HEAT CONTENT - J/G | 17166. | ( 7380 BTU/LB) |
| AVERAGE ASH CONTENT - % | 8.00 | |
| AVERAGE MOISTURE CONTENT - % | 33.00 | |
| AVERAGE SULFUR CONTENT - % | .90 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | RESEARCH COTTRELL | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 1.3 | |
| INITIAL START-UP DATE | 4/77 | |
| COMMERCIAL START-UP DATE | 10/78 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 71.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.40 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 34.6 | ( 550 GPM) |
| ** TREATMENT | | |
| TYPE | FLYASH STABILIZATION | |
| ** DISPOSAL | | |
| TYPE | LANDFILL | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER 1980, PARTICULARLY IN THE WETTED FILM CONTACT AREA AND THE MIST ELIMINATOR SECTION. THE MIST ELIMINATOR PLUGGING WAS RECENTLY SOLVED BY SWITCHING BACK TO LAKE WATER FOR MIST ELIMINATOR WASH FROM AN ASH POND WATER WASH THEY HAD BEEN TESTING.

THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK WAS REPLACED WITH STAINLESS STEEL.

THE UTILITY HAS PLANS TO INSTALL A NEW MODULE IN EARLY 1982. THE NEW MODULE HAS BECOME NECESSARY DUE TO THE INCREASE IN THE SULFUR CONTENT OF THE LIGNITE.

## SECTION 3
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | TEXAS UTILITIES | |
| PLANT NAME | MARTIN LAKE | |
| UNIT NUMBER | 2 | |
| CITY | TATUM | |
| STATE | TEXAS | |
| GROSS UNIT GENERATING CAPACITY - MW | 793.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 750.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 595.0 | |
| **** FUEL DATA** | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | LIGNITE | |
| AVERAGE HEAT CONTENT - J/G | 17166. | ( 7380 BTU/LB) |
| AVERAGE ASH CONTENT - % | 8.00 | |
| AVERAGE MOISTURE CONTENT - % | 33.00 | |
| AVERAGE SULFUR CONTENT - % | .90 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| **** FGD SYSTEM** | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | RESEARCH COTTRELL | |
| NEW/RETROFIT | NEW | |
| ENERGY CONSUMPTION - % | 1.3 | |
| INITIAL START-UP DATE | 5/78 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 71.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 99.40 | |
| ABSORBER SPARE CAPACITY INDEX - % | .0 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| **** WATER LOOP** | | |
| TYPE | CLOSED | |
| FRESH MAKE-UP WATER - LITER/S | 34.6 | ( 550 GPM) |
| **** TREATMENT** | | |
| TYPE | FLYASH STABILIZATION | |
| **** DISPOSAL** | | |
| TYPE | LANDFILL | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER 1980, PARTICULARLY IN THE WETTED FILM CONTACT AREA AND THE MIST ELIMINATOR SECTION. THE MIST ELIMINATOR PLUGGING WAS RECENTLY SOLVED BY SWITCHING BACK TO LAKE WATER FOR MIST ELIMINATOR WASH FROM AN ASH POND WATER WASH THEY HAD BEEN TESTING.

THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK WAS REPLACED WITH STAINLESS STEEL.

THE UTILITY HAS PLANS TO INSTALL A NEW MODULE IN THE FALL 1982. THE NEW MODULE HAS BECOME NECESSARY DUE TO THE INCREASE IN THE SULFUR CONTENT OF THE LIGNITE.

```
                                    SECTION 3
              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
---------------------------------------------------------------------------------------------

     COMPANY NAME                                     TEXAS UTILITIES
     PLANT NAME                                       MARTIN LAKE
     UNIT NUMBER                                      3
     CITY                                             TATUM
     STATE                                            TEXAS
     GROSS UNIT GENERATING CAPACITY - MW                 793.0
     NET UNIT GENERATING CAPACITY W/FGD - MW             750.0
     EQUIVALENT SCRUBBED CAPACITY - MW                   595.0

     ** FUEL DATA
         FUEL TYPE                                    COAL
         FUEL GRADE                                   LIGNITE
         AVERAGE HEAT CONTENT - J/G                    17166.          ( 7380 BTU/LB)
         AVERAGE ASH CONTENT - %                          8.00
         AVERAGE MOISTURE CONTENT - %                    33.00
         AVERAGE SULFUR CONTENT - %                        .90
         AVERAGE CHLORIDE CONTENT - %                 ********

     ** FGD SYSTEM
         GENERAL PROCESS TYPE                         WET SCRUBBING
         PROCESS TYPE                                 LIMESTONE
         SYSTEM SUPPLIER                              RESEARCH COTTRELL
         NEW/RETROFIT                                 NEW
         ENERGY CONSUMPTION - %                           1.3
         INITIAL START-UP DATE                         2/79
         COMMERCIAL START-UP DATE                     **/**
         SO2 DESIGN REMOVAL EFFICIENCY - %               71.00
         PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.40
         ABSORBER SPARE CAPACITY INDEX - %                 .0
         ABSORBER SPARE COMPONENTS INDEX                   .0

     ** TREATMENT
         TYPE                                         FLYASH STABILIZATION

     ** DISPOSAL
         TYPE                                         LANDFILL


-------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                                                                744

 2/80  SYSTEM                                                                696

 3/80  SYSTEM                                                                744

        ** PROBLEMS/SOLUTIONS/COMMENTS

                            PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER 1980, PARTICULARLY IN
                            THE WETTED FILM CONTACT AREA AND THE MIST ELIMINATOR SECTION.  THE
                            MIST ELIMINATOR PLUGGING WAS RECENTLY SOLVED BY SWITCHING BACK TO LAKE
                            WATER FOR MIST ELIMINATOR WASH FROM AN ASH POND WATER WASH THEY HAD BEEN
                            TESTING.

                            THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM.  MUCH OF THE FRP SUPPORT
                            WORK WAS REPLACED WITH STAINLESS STEEL.

                            THE UTILITY HAS PLANS TO INSTALL A NEW MODULE IN EARLY 1983.  THE NEW
                            MODULE HAS BECOME NECESSARY DUE TO THE INCREASE IN THE SULFUR CONTENT OF
                            THE LIGNITE.
```

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                                        SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
------------------------------------------------------------------------------------------------------

COMPANY NAME                                        TEXAS UTILITIES
PLANT NAME                                          MONTICELLO
UNIT NUMBER                                         3
CITY                                                MT. PLEASANT
STATE                                               TEXAS
GROSS UNIT GENERATING CAPACITY - MW                   800.0
NET UNIT GENERATING CAPACITY W/FGD - MW               750.0
EQUIVALENT SCRUBBED CAPACITY - MW                     800.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      LIGNITE
    AVERAGE HEAT CONTENT - J/G                      *******        (****** BTU/LB)
    AVERAGE ASH CONTENT - %                            18.90
    AVERAGE MOISTURE CONTENT - %                       31.90
    AVERAGE SULFUR CONTENT - %                          1.50
    AVERAGE CHLORIDE CONTENT - %                         .04

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    LIMESTONE
    SYSTEM SUPPLIER                                 CHEMICO
    NEW/RETROFIT                                    NEW
    ENERGY CONSUMPTION - %                          *******
    INITIAL START-UP DATE                            5/78
    COMMERCIAL START-UP DATE                        10/78
    SO2 DESIGN REMOVAL EFFICIENCY - %                  74.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.50
    ABSORBER SPARE CAPACITY INDEX - %                    .0
    ABSORBER SPARE COMPONENTS INDEX                      .0

** WATER LOOP
    TYPE                                            CLOSED
    FRESH MAKE-UP WATER - LITER/S                      34.4        (  546 GPM)

** TREATMENT
    TYPE                                            FLYASH STABILIZATION

** DISPOSAL
    TYPE                                            LANDFILL

----------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

1/80  SYSTEM                                                                744

2/80  SYSTEM                                                                696

3/80  SYSTEM                                                                744

        ** PROBLEMS/SOLUTIONS/COMMENTS
                           NO PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1980.
```

```
                              SECTION 3
     DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS
--------------------------------------------------------------------------------------------------

COMPANY NAME                                     UTAH POWER & LIGHT
PLANT NAME                                       HUNTER
UNIT NUMBER                                      1
CITY                                             CASTLE DALE
STATE                                            UTAH
GROSS UNIT GENERATING CAPACITY - MW                400.0
NET UNIT GENERATING CAPACITY W/FGD - MW            400.0
EQUIVALENT SCRUBBED CAPACITY - MW                  360.0

** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                     29075.        ( 12500 BTU/LB)
    AVERAGE ASH CONTENT - %                         10.00
    AVERAGE MOISTURE CONTENT - %                     6.50
    AVERAGE SULFUR CONTENT - %                        .55
    AVERAGE CHLORIDE CONTENT - %                 ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                         WET SCRUBBING
    PROCESS TYPE                                 LIME
    SYSTEM SUPPLIER                              CHEMICO
    NEW/RETROFIT                                 NEW
    ENERGY CONSUMPTION - %                       *******
    INITIAL START-UP DATE                           5/79
    COMMERCIAL START-UP DATE                       **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %               80.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.50
    ABSORBER SPARE COMPONENTS INDEX                    .0

** WATER LOOP
    TYPE                                         OPEN
    FRESH MAKE-UP WATER - LITER/S                *******        (***** GPM)

** TREATMENT
    TYPE                                         FLYASH STABILIZATION

** DISPOSAL
    TYPE                                         POND


-------------------------------------------PERFORMANCE DATA---------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ----- ----- ------

 1/80  SYSTEM                                                              744

 2/80  SYSTEM                                                              696

 3/80  SYSTEM                                                              744

         ** PROBLEMS/SOLUTIONS/COMMENTS

                  NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.
```

## SECTION 3

## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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--------------------------------------------------------------------------------------------------------------

COMPANY NAME                                    UTAH POWER & LIGHT
PLANT NAME                                      HUNTINGTON
UNIT NUMBER                                     1
CITY                                            PRICE
STATE                                           UTAH
GROSS UNIT GENERATING CAPACITY - MW               430.0
NET UNIT GENERATING CAPACITY W/FGD - MW           400.0
EQUIVALENT SCRUBBED CAPACITY - MW                 366.0

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                   29075.         ( 12500 BTU/LB)
    AVERAGE ASH CONTENT - %                         10.00
    AVERAGE MOISTURE CONTENT - %                     6.50
    AVERAGE SULFUR CONTENT - %                        .55
    AVERAGE CHLORIDE CONTENT - %                *********

** FGD SYSTEM
    GENERAL PROCESS TYPE                        WET SCRUBBING
    PROCESS TYPE                                LIME
    SYSTEM SUPPLIER                             CHEMICO
    NEW/RETROFIT                                NEW
    ENERGY CONSUMPTION - %                           1.6
    INITIAL START-UP DATE                        5/78
    COMMERCIAL START-UP DATE                    **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %               80.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.50
    ABSORBER SPARE CAPACITY INDEX - %                2.5
    ABSORBER SPARE COMPONENTS INDEX                   .0

** WATER LOOP
    TYPE                                        CLOSED
    FRESH MAKE-UP WATER - LITER/S                   18.9        (  300 GPM)

** TREATMENT
    TYPE                                        FLYASH STABILIZATION

** DISPOSAL
    TYPE                                        LANDFILL


-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 1/80  SYSTEM                                                                744

 2/80  SYSTEM                                                                696

 3/80  SYSTEM                                                                744

     ** PROBLEMS/SOLUTIONS/COMMENTS

                  NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.
```

## SECTION 4
## SUMMARY OF FGD SYSTEMS BY COMPANY

| | | | STATUS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | TOTAL | | OPERATIONAL | | CONSTRUCTION | | CONTRACT AWARDED | | PLANNED | |
| COMPANY NAME | NO. | MW | NO. | MW | NO. | MW | NO. | MW | NO. | MW |
| ALABAMA ELECTRIC COOP | 2 | 358. | 2 | 358. | 0 | 0. | 0 | 0. | 0 | 0. |
| ALLEGHENY POWER SYSTEM | 3 | 1338. | 1 | 519. | 1 | 519. | 1 | 300. | 0 | 0. |
| ARIZONA ELECTRIC POWER COOP | 2 | 390. | 2 | 390. | 0 | 0. | 0 | 0. | 0 | 0. |
| ARIZONA PUBLIC SERVICE | 8 | 2684. | 5 | 1048. | 1 | 126. | 2 | 1510. | 0 | 0. |
| ASSOCIATED ELECTRIC COOP | 1 | 670. | 0 | 0. | 1 | 670. | 0 | 0. | 0 | 0. |
| BASIN ELECTRIC POWER COOP | 5 | 2680. | 0 | 0. | 4 | 2240. | 0 | 0. | 1 | 440. |
| BIG RIVERS ELECTRIC | 4 | 1364. | 1 | 242. | 1 | 242. | 0 | 0. | 2 | 880. |
| CENTRAL ILLINOIS LIGHT | 2 | 794. | 1 | 378. | 0 | 0. | 0 | 0. | 1 | 416. |
| CENTRAL ILLINOIS PUBLIC SERV | 1 | 617. | 1 | 617. | 0 | 0. | 0 | 0. | 0 | 0. |
| CENTRAL MAINE POWER | 1 | 600. | 0 | 0. | 0 | 0. | 0 | 0. | 1 | 600. |
| CINCINNATI GAS & ELECTRIC | 2 | 1300. | 0 | 0. | 1 | 650. | 0 | 0. | 1 | 650. |
| COLORADO UTE ELECTRIC ASSN. | 3 | 1341. | 1 | 447. | 1 | 447. | 0 | 0. | 1 | 447. |
| COLUMBUS & SOUTHERN OHIO ELEC. | 4 | 1572. | 2 | 822. | 0 | 0. | 0 | 0. | 2 | 750. |
| COMMONWEALTH EDISON | 1 | 450. | 0 | 0. | 1 | 450. | 0 | 0. | 0 | 0. |
| COOPERATIVE POWER ASSOCIATION | 2 | 654. | 1 | 327. | 1 | 327. | 0 | 0. | 0 | 0. |
| DELMARVA POWER & LIGHT | 2 | 730. | 0 | 0. | 1 | 180. | 0 | 0. | 1 | 550. |
| DESERET GENERATION & TRANS COO | 2 | 820. | 0 | 0. | 0 | 0. | 0 | 0. | 2 | 820. |
| DUQUESNE LIGHT | 2 | 920. | 2 | 920. | 0 | 0. | 0 | 0. | 0 | 0. |
| EAST KENTUCKY POWER COOP | 3 | 1800. | 0 | 0. | 1 | 500. | 0 | 0. | 2 | 1300. |
| GENERAL PUBLIC UTILITIES | 5 | 3475. | 0 | 0. | 0 | 0. | 0 | 0. | 5 | 3475. |
| GRAND HAVEN BRD OF LIGHT & PWR | 1 | 81. | 0 | 0. | 0 | 0. | 1 | 81. | 0 | 0. |
| HOOSIER ENERGY | 2 | 882. | 0 | 0. | 1 | 441. | 1 | 441. | 0 | 0. |
| HOUSTON LIGHTING & POWER CO. | 1 | 492. | 0 | 0. | 0 | 0. | 1 | 492. | 0 | 0. |
| INDIANAPOLIS POWER & LIGHT | 5 | 3012. | 1 | 532. | 1 | 530. | 0 | 0. | 3 | 1950. |
| KANSAS CITY POWER & LIGHT | 3 | 1054. | 3 | 1054. | 0 | 0. | 0 | 0. | 0 | 0. |
| KANSAS POWER & LIGHT | 4 | 1575. | 3 | 1085. | 1 | 490. | 0 | 0. | 0 | 0. |
| KENTUCKY UTILITIES | 1 | 64. | 1 | 64. | 0 | 0. | 0 | 0. | 0 | 0. |
| LAKELAND UTILITIES | 1 | 364. | 0 | 0. | 1 | 364. | 0 | 0. | 0 | 0. |
| LOUISVILLE GAS & ELECTRIC | 10 | 3554. | 5 | 1201. | 3 | 1203. | 0 | 0. | 2 | 1150. |
| MICHIGAN SO. CENTRAL PWR AGENC | 1 | 55. | 0 | 0. | 0 | 0. | 1 | 55. | 0 | 0. |
| MIDDLE SOUTH UTILITIES | 6 | 5340. | 0 | 0. | 0 | 0. | 0 | 0. | 6 | 5340. |
| MINNESOTA POWER & LIGHT | 1 | 475. | 0 | 0. | 1 | 475. | 0 | 0. | 0 | 0. |
| MINNKOTA POWER COOPERATIVE | 1 | 405. | 1 | 405. | 0 | 0. | 0 | 0. | 0 | 0. |
| MONTANA POWER | 4 | 2120. | 2 | 720. | 2 | 1400. | 0 | 0. | 0 | 0. |
| MUSCATINE POWER & WATER | 1 | 160. | 0 | 0. | 0 | 0. | 1 | 160. | 0 | 0. |
| NEVADA POWER | 10 | 3125. | 3 | 375. | 0 | 0. | 0 | 0. | 7 | 2750. |
| NEW YORK STATE ELEC & GAS | 1 | 870. | 0 | 0. | 0 | 0. | 0 | 0. | 1 | 870. |
| NIAGARA MOHAWK POWER COOP | 1 | 100. | 0 | 0. | 1 | 100. | 0 | 0. | 0 | 0. |
| NORTHERN INDIANA PUB SERVICE | 3 | 957. | 1 | 115. | 0 | 0. | 0 | 0. | 2 | 842. |
| NORTHERN STATES POWER | 4 | 2450. | 2 | 1480. | 1 | 110. | 0 | 0. | 1 | 860. |
| OTTER TAIL POWER | 1 | 440. | 0 | 0. | 1 | 440. | 0 | 0. | 0 | 0. |
| PACIFIC GAS & ELECTRIC | 2 | 1600. | 0 | 0. | 0 | 0. | 0 | 0. | 2 | 1600. |
| PACIFIC POWER & LIGHT | 1 | 550. | 1 | 550. | 0 | 0. | 0 | 0. | 0 | 0. |
| PENNSYLVANIA POWER | 3 | 2751. | 2 | 1834. | 1 | 917. | 0 | 0. | 0 | 0. |
| PHILADELPHIA ELECTRIC | 4 | 844. | 1 | 120. | 2 | 574. | 1 | 150. | 0 | 0. |
| POTOMAC ELECTRIC POWER | 1 | 800. | 0 | 0. | 0 | 0. | 0 | 0. | 1 | 800. |
| PUBLIC SERVICE INDIANA | 1 | 650. | 0 | 0. | 0 | 0. | 1 | 650. | 0 | 0. |
| PUBLIC SERVICE OF NEW MEXICO | 4 | 1779. | 3 | 1245. | 1 | 534. | 0 | 0. | 0 | 0. |
| PWR AUTHORITY OF STATE OF NY | 1 | 700. | 0 | 0. | 0 | 0. | 0 | 0. | 1 | 700. |
| SALT RIVER PROJECT | 3 | 840. | 1 | 280. | 1 | 280. | 0 | 0. | 1 | 280. |
| SAN MIGUEL ELECTRIC COOP | 1 | 400. | 0 | 0. | 1 | 400. | 0 | 0. | 0 | 0. |
| SEMINOLE ELECTRIC | 2 | 1240. | 0 | 0. | 0 | 0. | 2 | 1240. | 0 | 0. |
| SIKESTON BOARD OF MUNIC. UTIL. | 1 | 235. | 0 | 0. | 1 | 235. | 0 | 0. | 0 | 0. |
| SOUTH CAROLINA PUBLIC SERVICE | 3 | 700. | 1 | 140. | 1 | 280. | 1 | 280. | 0 | 0. |
| SOUTH MISSISSIPPI ELEC PWR | 2 | 248. | 2 | 248. | 0 | 0. | 0 | 0. | 0 | 0. |
| SOUTHERN ILLINOIS POWER COOP | 2 | 484. | 1 | 184. | 0 | 0. | 0 | 0. | 1 | 300. |
| SOUTHERN INDIANA GAS & ELEC | 1 | 265. | 1 | 265. | 0 | 0. | 0 | 0. | 0 | 0. |
| SOUTHWESTERN ELECTRIC POWER | 1 | 720. | 0 | 0. | 0 | 0. | 1 | 720. | 0 | 0. |
| SPRINGFIELD CITY UTILITIES | 1 | 194. | 1 | 194. | 0 | 0. | 0 | 0. | 0 | 0. |
| SPRINGFIELD WATER, LIGHT & PWR | 1 | 205. | 0 | 0. | 1 | 205. | 0 | 0. | 0 | 0. |
| ST. JOE ZINC | 1 | 60. | 1 | 60. | 0 | 0. | 0 | 0. | 0 | 0. |
| TAMPA ELECTRIC | 1 | 475. | 0 | 0. | 0 | 0. | 0 | 0. | 1 | 475. |
| TENNESSEE VALLEY AUTHORITY | 7 | 3153. | 3 | 570. | 3 | 1983. | 1 | 600. | 0 | 0. |
| TEXAS MUNICIPAL POWER AGENCY | 1 | 400. | 0 | 0. | 1 | 400. | 0 | 0. | 0 | 0. |
| TEXAS POWER & LIGHT | 3 | 1882. | 0 | 0. | 1 | 382. | 2 | 1500. | 0 | 0. |

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUTING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

## SECTION 4
## SUMMARY OF FGD SYSTEMS BY COMPANY

| | TOTAL | | STATUS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | OPERATIONAL | | CONSTRUCTION | | CONTRACT AWARDED | | PLANNED | |
| COMPANY NAME | NO. | MW | NO. | MW | NO. | MW | NO. | MW | NO. | MW |
| TEXAS UTILITIES | 8 | 5585. | 4 | 2585. | 0 | 0. | 1 | 750. | 3 | 2250. |
| TUCSON ELECTRIC POWER | 2 | 740. | 0 | 0. | 0 | 0. | 2 | 740. | 0 | 0. |
| UNITED POWER ASSOCIATION | 1 | 50. | 0 | 0. | 0 | 0. | 1 | 50. | 0 | 0. |
| UTAH POWER & LIGHT | 5 | 1886. | 2 | 726. | 1 | 360. | 2 | 800. | 0 | 0. |
| TOTALS | 181 | 81568. | 65 | 22100. | 42 | 18454. | 23 | 10519. | 51 | 30495. |

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUTING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

## SECTION 5
## SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

| | | | STATUS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | | OPERATIONAL | | CONSTRUCTION | | CONTRACT AWARDED | |
| SYSTEM SUPPLIER/PROCESS | NO. | MW | NO. | MW | NO. | MW | NO. | MW |
| ADL/COMBUSTION EQUIP ASSOCIATE | | | | | | | | |
| DUAL ALKALI | 1 | 299. | 1 | 299. | 0 | 0. | 0 | 0. |
| LIME | 1 | 500. | 0 | 0. | 1 | 500. | 0 | 0. |
| LIME/ALKALINE FLYASH | 5 | 2525. | 3 | 1125. | 2 | 1400. | 0 | 0. |
| SODIUM CARBONATE | 3 | 375. | 3 | 375. | 0 | 0. | 0 | 0. |
| TOTAL - | 10 | 3699. | 7 | 1799. | 3 | 1900. | 0 | 0. |
| AIR CORRECTION DIVISION, UOP | | | | | | | | |
| LIME | 2 | 822. | 2 | 822. | 0 | 0. | 0 | 0. |
| LIMESTONE | 4 | 1896. | 2 | 726. | 1 | 450. | 1 | 720. |
| LIME/LIMESTONE | 1 | 10. | 1 | 10. | 0 | 0. | 0 | 0. |
| SODIUM CARBONATE | 1 | 550. | 1 | 550. | 0 | 0. | 0 | 0. |
| TOTAL - | 8 | 3278. | 6 | 2108. | 1 | 450. | 1 | 720. |
| AMERICAN AIR FILTER | | | | | | | | |
| LIME | 6 | 1673. | 4 | 936. | 2 | 737. | 0 | 0. |
| LIMESTONE | 1 | 280. | 0 | 0. | 0 | 0. | 1 | 280. |
| TOTAL - | 7 | 1953. | 4 | 936. | 2 | 737. | 1 | 280. |
| BABCOCK & WILCOX | | | | | | | | |
| LIME | 4 | 1769. | 1 | 519. | 2 | 1169. | 1 | 81. |
| LIMESTONE | 8 | 2532. | 3 | 1198. | 4 | 1279. | 1 | 55. |
| LIME/SPRAY DRYING | 1 | 600. | 0 | 0. | 1 | 600. | 0 | 0. |
| TOTAL - | 13 | 4901. | 4 | 1717. | 7 | 3048. | 2 | 136. |
| BUELL/ENVIROTECH | | | | | | | | |
| DUAL ALKALI | 1 | 617. | 1 | 617. | 0 | 0. | 0 | 0. |
| TOTAL - | 1 | 617. | 1 | 617. | 0 | 0. | 0 | 0. |
| BUREAU OF MINES | | | | | | | | |
| CITRATE | 1 | 60. | 1 | 60. | 0 | 0. | 0 | 0. |
| TOTAL - | 1 | 60. | 1 | 60. | 0 | 0. | 0 | 0. |
| CHEMICO | | | | | | | | |
| LIME | 8 | 4140. | 6 | 3480. | 1 | 360. | 1 | 300. |
| LIMESTONE | 8 | 5000. | 1 | 800. | 2 | 1408. | 5 | 2792. |
| LIME/ALKALINE FLYASH | 3 | 579. | 3 | 579. | 0 | 0. | 0 | 0. |
| LIME/LIMESTONE | 1 | 10. | 1 | 10. | 0 | 0. | 0 | 0. |
| TOTAL - | 20 | 9729. | 11 | 4869. | 3 | 1768. | 6 | 3092. |
| COMBUSTION ENGINEERING | | | | | | | | |
| LIME | 6 | 1160. | 4 | 452. | 2 | 708. | 0 | 0. |
| LIMESTONE | 7 | 2932. | 3 | 1085. | 4 | 1847. | 0 | 0. |
| LIMESTONE/ALKALINE FLYASH | 2 | 1480. | 2 | 1480. | 0 | 0. | 0 | 0. |
| LIME/ALKALINE FLYASH | 2 | 654. | 1 | 327. | 1 | 327. | 0 | 0. |
| TOTAL - | 17 | 6226. | 10 | 3344. | 7 | 2882. | 0 | 0. |
| DAVY MCKEE | | | | | | | | |
| WELLMAN LORD | 1 | 180. | 0 | 0. | 1 | 180. | 0 | 0. |
| TOTAL - | 1 | 180. | 0 | 0. | 1 | 180. | 0 | 0. |
| DAVY POWERGAS | | | | | | | | |
| WELLMAN LORD | 5 | 1894. | 4 | 1360. | 1 | 534. | 0 | 0. |
| TOTAL - | 5 | 1894. | 4 | 1360. | 1 | 534. | 0 | 0. |
| FMC | | | | | | | | |
| DUAL ALKALI | 1 | 265. | 1 | 265. | 0 | 0. | 0 | 0. |
| TOTAL - | 1 | 265. | 1 | 265. | 0 | 0. | 0 | 0. |
| JOY MFG/NIRO ATOMIZER | | | | | | | | |
| LIME/SPRAY DRYING | 4 | 1290. | 0 | 0. | 2 | 550. | 2 | 740. |
| TOTAL - | 4 | 1290. | 0 | 0. | 2 | 550. | 2 | 740. |

## SECTION 5
## SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

| | | | STATUS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | | OPERATIONAL | | CONSTRUCTION | | CONTRACT AWARDED | |
| SYSTEM SUPPLIER/PROCESS | NO. | MW | NO. | MW | NO. | MW | NO. | MW |
| KOMLINE & SANDERSON | | | | | | | | |
| LIME/SPRAY DRYING | 1 | 50. | 0 | 0. | 0 | 0. | 1 | 50. |
| TOTAL - | 1 | 50. | 0 | 0. | 0 | 0. | 1 | 50. |
| MITSUBISHI HEAVY INDUSTRIES | | | | | | | | |
| LIMESTONE | 2 | 882. | 0 | 0. | 1 | 441. | 1 | 441. |
| TOTAL - | 2 | 882. | 0 | 0. | 1 | 441. | 1 | 441. |
| PEABODY PROCESS SYSTEMS | | | | | | | | |
| LIMESTONE | 6 | 2492. | 3 | 805. | 1 | 447. | 2 | 1240. |
| LIME/ALKALINE FLYASH | 1 | 475. | 0 | 0. | 1 | 475. | 0 | 0. |
| TOTAL - | 7 | 2967. | 3 | 805. | 2 | 922. | 2 | 1240. |
| PULLMAN KELLOGG | | | | | | | | |
| LIME | 1 | 917. | 0 | 0. | 1 | 917. | 0 | 0. |
| LIMESTONE | 4 | 1880. | 1 | 280. | 2 | 950. | 1 | 650. |
| TOTAL - | 5 | 2797. | 1 | 280. | 3 | 1867. | 1 | 650. |
| RESEARCH COTTRELL | | | | | | | | |
| LIMESTONE | 14 | 5615. | 7 | 2644. | 5 | 2061. | 2 | 910. |
| TOTAL - | 14 | 5615. | 7 | 2644. | 5 | 2061. | 2 | 910. |
| RILEY ENVIRONEERING | | | | | | | | |
| MAGNESIUM OXIDE | 1 | 600. | 0 | 0. | 0 | 0. | 1 | 600. |
| TOTAL - | 1 | 600. | 0 | 0. | 0 | 0. | 1 | 600. |
| RILEY STOKER/ENVIRONEERING | | | | | | | | |
| LIMESTONE | 3 | 626. | 3 | 626. | 0 | 0. | 0 | 0. |
| TOTAL - | 3 | 626. | 3 | 626. | 0 | 0. | 0 | 0. |
| ROCKWELL INTERNATIONAL | | | | | | | | |
| AQUEOUS CARBONATE | 1 | 100. | 0 | 0. | 1 | 100. | 0 | 0. |
| TOTAL - | 1 | 100. | 0 | 0. | 1 | 100. | 0 | 0. |
| TENNESSEE VALLEY AUTHORITY | | | | | | | | |
| LIMESTONE | 1 | 550. | 1 | 550. | 0 | 0. | 0 | 0. |
| TOTAL - | 1 | 550. | 1 | 550. | 0 | 0. | 0 | 0. |
| UNITED ENGINEERS | | | | | | | | |
| LIME | 2 | 1510. | 0 | 0. | 0 | 0. | 2 | 1510. |
| MAGNESIUM OXIDE | 4 | 844. | 1 | 120. | 2 | 574. | 1 | 150. |
| TOTAL - | 6 | 2354. | 1 | 120. | 2 | 574. | 3 | 1660. |
| WHEELABRATOR-FRYE/R.I. | | | | | | | | |
| AQUEOUS CARBONATE/SPRAY DRYING | 1 | 440. | 0 | 0. | 1 | 440. | 0 | 0. |
| TOTAL - | 1 | 440. | 0 | 0. | 1 | 440. | 0 | 0. |
| TOTAL - | 130 | 51073. | 65 | 22100. | 42 | 18454. | 23 | 10519. |

## SECTION 6
## SUMMARY OF FGD SYSTEMS BY PROCESS

| PROCESS | TOTAL NO. | TOTAL MW | STATUS: OPERATIONAL NO. | OPERATIONAL MW | CONSTRUCTION NO. | CONSTRUCTION MW | CONTRACT AWARDED NO. | CONTRACT AWARDED MW | PLANNED NO. | PLANNED MW |
|---|---|---|---|---|---|---|---|---|---|---|
| AQUEOUS CARBONATE | 1 | 100. | 0 | 0. | 1 | 100. | 0 | 0. | 0 | 0. |
| CITRATE | 1 | 60. | 1 | 60. | 0 | 0. | 0 | 0. | 0 | 0. |
| LIMESTONE | 3 | 1760. | 0 | 0. | 0 | 0. | 1 | 160. | 2 | 1600. |
| MAGNESIUM OXIDE | 5 | 1444. | 1 | 120. | 2 | 574. | 2 | 750. | 0 | 0. |
| WELLMAN LORD | 6 | 2074. | 4 | 1360. | 2 | 714. | 0 | 0. | 0 | 0. |
| SUBTOTAL - SALEABLE PRODUCT | 16 | 5438. | 6 | 1540. | 5 | 1388. | 3 | 910. | 2 | 1600. |
| AQUEOUS CARBONATE/SPRAY DRYING | 1 | 440. | 0 | 0. | 1 | 440. | 0 | 0. | 0 | 0. |
| DUAL ALKALI | 5 | 2023. | 3 | 1181. | 0 | 0. | 0 | 0. | 2 | 842. |
| LIME | 34 | 13871. | 17 | 6209. | 9 | 4391. | 4 | 1891. | 4 | 1380. |
| LIMESTONE | 66 | 29721. | 24 | 8714. | 20 | 8883. | 13 | 6928. | 9 | 5196. |
| LIMESTONE/ALKALINE FLYASH | 2 | 1480. | 2 | 1480. | 0 | 0. | 0 | 0. | 0 | 0. |
| LIME/ALKALINE FLYASH | 11 | 4233. | 7 | 2031. | 4 | 2202. | 0 | 0. | 0 | 0. |
| LIME/LIMESTONE | 2 | 20. | 2 | 20. | 0 | 0. | 0 | 0. | 0 | 0. |
| LIME/SPRAY DRYING | 8 | 2827. | 0 | 0. | 3 | 1150. | 3 | 790. | 2 | 887. |
| PROCESS NOT SELECTED | 31 | 20340. | 0 | 0. | 0 | 0. | 0 | 0. | 31 | 20340. |
| SODIUM CARBONATE | 5 | 1175. | 4 | 925. | 0 | 0. | 0 | 0. | 1 | 250. |
| SUBTOTAL - THROWAWAY PRODUCT | 165 | 76130. | 59 | 20560. | 37 | 17066. | 20 | 9609. | 49 | 28895. |
| TOTALS | 181 | 81568. | 65 | 22100. | 42 | 18454. | 23 | 10519. | 51 | 30495. |
| SALEABLE % OF TOTAL MW |  | 7 |  | 7 |  | 8 |  | 9 |  | 5 |

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## SECTION 7
## SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

| PROCESS/ UNIT NAME | UNIT NO. | CAPACITY MW | INITIAL STARTUP | COMMERCIAL STARTUP |
|---|---|---|---|---|
| CITRATE | | | | |
| G.F. WEATON | 1 | 60. | 11/79 | 1/80 |
| | | 60. | | |
| DUAL ALKALI | | | | |
| A.B. BROWN | 1 | 265. | 4/79 | 4/79 |
| CANE RUN | 6 | 299. | 4/79 | 0/ 0 |
| NEWTON | 1 | 617. | 9/79 | 12/79 |
| | | 1181. | | |
| LIME | | | | |
| BRUCE MANSFIELD | 1 | 917. | 12/75 | 6/76 |
| BRUCE MANSFIELD | 2 | 917. | 7/77 | 0/ 0 |
| CANE RUN | 4 | 188. | 8/76 | 8/77 |
| CANE RUN | 5 | 200. | 12/77 | 7/78 |
| CONESVILLE | 5 | 411. | 1/77 | 2/77 |
| CONESVILLE | 6 | 411. | 6/78 | 0/ 0 |
| ELRAMA | 1-4 | 510. | 10/75 | 10/75 |
| GREEN | 1 | 242. | 12/79 | 12/79 |
| GREEN RIVER | 1-3 | 64. | 9/75 | 6/76 |
| HAWTHORN | 3 | 90. | 11/72 | 0/ 0 |
| HAWTHORN | 4 | 90. | 8/72 | 0/ 0 |
| HUNTER | 1 | 360. | 5/79 | 0/ 0 |
| HUNTINGTON | 1 | 366. | 5/78 | 0/ 0 |
| MILL CREEK | 3 | 442. | 8/78 | 3/79 |
| PADDY'S RUN | 6 | 72. | 4/73 | 0/ 0 |
| PHILLIPS | 1-6 | 410. | 7/73 | 0/ 0 |
| PLEASANTS | 1 | 519. | 3/79 | 0/ 0 |
| | | 6209. | | |
| LIMESTONE | | | | |
| APACHE | 2 | 195. | 8/78 | 1/79 |
| APACHE | 3 | 195. | 6/79 | 4/79 |
| CHOLLA | 1 | 119. | 10/73 | 12/73 |
| CHOLLA | 2 | 350. | 4/78 | 0/ 0 |
| CORONADO | 1 | 280. | 11/79 | 12/79 |
| CRAIG | 2 | 447. | 8/79 | 6/80 |
| DUCK CREEK | 1 | 378. | 7/76 | 8/78 |
| JEFFREY | 1 | 540. | 8/78 | 0/ 0 |
| LA CYGNE | 1 | 874. | 2/73 | 6/73 |
| LAWRENCE | 4 | 125. | 1/76 | 0/ 0 |
| LAWRENCE | 5 | 420. | 11/71 | 0/ 0 |
| MARION | 4 | 184. | 5/79 | 5/79 |
| MARTIN LAKE | 1 | 595. | 4/77 | 10/78 |
| MARTIN LAKE | 2 | 595. | 5/78 | 0/ 0 |
| MARTIN LAKE | 3 | 595. | 2/79 | 0/ 0 |
| MONTICELLO | 3 | 800. | 5/78 | 10/78 |
| PETERSBURG | 3 | 532. | 12/77 | 12/77 |
| R.D. MORROW | 1 | 124. | 8/78 | 8/78 |
| R.D. MORROW | 2 | 124. | 6/79 | 6/79 |
| SOUTHWEST | 1 | 194. | 4/77 | 0/ 0 |
| TOMBIGBEE | 2 | 179. | 9/78 | 9/78 |
| TOMBIGBEE | 3 | 179. | 6/79 | 6/79 |
| WIDOWS CREEK | 8 | 550. | 5/77 | 1/78 |
| WINYAH | 2 | 140. | 7/77 | 0/ 0 |
| | | 8714. | | |
| LIMESTONE/ALKALINE FLYASH | | | | |
| SHERBURNE | 1 | 740. | 3/76 | 5/76 |
| SHERBURNE | 2 | 740. | 4/77 | 4/77 |
| | | 1480. | | |

## SECTION 7
## SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

| PROCESS/ UNIT NAME | UNIT NO. | CAPACITY MW | INITIAL STARTUP | COMMERCIAL STARTUP |
|---|---|---|---|---|
| LIME/ALKALINE FLYASH | | | | |
| COAL CREEK | 1 | 327. | 8/79 | 0/ 0 |
| COLSTRIP | 1 | 360. | 9/75 | 11/75 |
| COLSTRIP | 2 | 360. | 5/76 | 10/76 |
| FOUR CORNERS | 1 | 175. | 11/79 | 0/ 0 |
| FOUR CORNERS | 2 | 175. | 11/79 | 0/ 0 |
| FOUR CORNERS | 3 | 229. | 11/79 | 0/ 0 |
| MILTON R. YOUNG | 2 | 405. | 9/77 | 6/78 |
| | | 2031. | | |
| LIME/LIMESTONE | | | | |
| SHAWNEE | 10A | 10. | 4/72 | 0/ 0 |
| SHAWNEE | 10B | 10. | 4/72 | 0/ 0 |
| | | 20. | | |
| MAGNESIUM OXIDE | | | | |
| EDDYSTONE | 1A | 120. | 9/75 | 9/75 |
| | | 120. | | |
| SODIUM CARBONATE | | | | |
| JIM BRIDGER | 4 | 550. | 9/79 | 2/80 |
| REID GARDNER | 1 | 125. | 4/74 | 0/ 0 |
| REID GARDNER | 2 | 125. | 4/74 | 0/ 0 |
| REID GARDNER | 3 | 125. | 6/76 | 7/76 |
| | | 925. | | |
| WELLMAN LORD | | | | |
| DEAN H. MITCHELL | 11 | 115. | 7/76 | 6/77 |
| SAN JUAN | 1 | 361. | 4/78 | 0/ 0 |
| SAN JUAN | 2 | 350. | 8/78 | 0/ 0 |
| SAN JUAN | 3 | 534. | 12/79 | 0/ 0 |
| | | 1360. | | |
| TOTAL | | 22100. | | |

## SECTION 8
## SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

| PROCESS/ UNIT NAME | UNIT NO | THROWAWAY | | BYPRODUCT | |
|---|---|---|---|---|---|
| | | STABILIZED | UNSTABILIZED | TYPE | DISPOSITION |
| CITRATE | | | | | |
| G.F. WEATON | 1 | | | ELEMENTAL SULFUR | |
| DUAL ALKALI | | | | | |
| A.B. BROWN | 1 | LANDFILL | | | |
| CANE RUN | 6 | LANDFILL | | | |
| NEWTON | 1 | | | | |
| LIME | | | | | |
| BRUCE MANSFIELD | 1 | LANDFILL | | | |
| BRUCE MANSFIELD | 2 | LANDFILL | | | |
| CANE RUN | 4 | LINED POND | | | |
| CANE RUN | 5 | LINED POND | | | |
| CONESVILLE | 5 | POND | | | |
| CONESVILLE | 6 | POND | | | |
| ELRAMA | 1-4 | LANDFILL | | | |
| GREEN | 1 | | | | |
| GREEN RIVER | 1-3 | | LINED POND | | |
| HAWTHORN | 3 | POND | | | |
| HAWTHORN | 4 | POND | | | |
| HUNTER | 1 | POND | | | |
| HUNTINGTON | 1 | LANDFILL | | | |
| MILL CREEK | 3 | POND | | | |
| PADDY'S RUN | 6 | POND | | | |
| PHILLIPS | 1-6 | LANDFILL | | | |
| PLEASANTS | 1 | | | | |
| LIMESTONE | | | | | |
| APACHE | 2 | | POND | | |
| APACHE | 3 | | POND | | |
| CHOLLA | 1 | | POND | | |
| CHOLLA | 2 | | POND | | |
| CORONADO | 1 | | LINED POND | | |
| CRAIG | 2 | | MINEFILL | | TO WASTE |
| DUCK CREEK | 1 | | LINED POND | | |
| JEFFREY | 1 | POND | | | |
| LA CYGNE | 1 | | UNLINED POND | | |
| LAWRENCE | 4 | POND | | | |
| LAWRENCE | 5 | POND | | | |
| MARION | 4 | LANDFILL | | | |
| MARTIN LAKE | 1 | LANDFILL | | | |
| MARTIN LAKE | 2 | LANDFILL | | | |
| MARTIN LAKE | 3 | LANDFILL | | | |
| MONTICELLO | 3 | LANDFILL | | | |
| PETERSBURG | 3 | LANDFILL | | | |
| R.D. MORROW | 1 | LANDFILL | | | |
| R.D. MORROW | 2 | LANDFILL | | | |
| SOUTHWEST | 1 | LANDFILL | | | |
| TOMBIGBEE | 2 | LINED POND | | CASO3-CASO4 | POND |
| TOMBIGBEE | 3 | LINED POND | | CASO3-CASO4 | POND |
| WIDOWS CREEK | 8 | | POND | | |
| WINYAH | 2 | | POND | | |
| LIMESTONE/ALKALINE FLYASH | | | | | |
| SHERBURNE | 1 | LINED POND | | | |
| SHERBURNE | 2 | LINED POND | | | |
| LIME/ALKALINE FLYASH | | | | | |
| COAL CREEK | 1 | LINED POND | | | |
| COLSTRIP | 1 | | POND | | |
| COLSTRIP | 2 | | POND | | |
| FOUR CORNERS | 1 | | | | |
| FOUR CORNERS | 2 | | | | |
| FOUR CORNERS | 3 | | | | |
| MILTON R. YOUNG | 2 | | MINEFILL | | |

## SECTION 8

## SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

| PROCESS/ UNIT NAME | UNIT NO | THROWAWAY | | BYPRODUCT | |
|---|---|---|---|---|---|
| | | STABILIZED | UNSTABILIZED | TYPE | DISPOSITION |
| **LIME/LIMESTONE** | | | | | |
| SHAWNEE | 10A | | | | |
| SHAWNEE | 10B | | | | |
| **MAGNESIUM OXIDE** | | | | | |
| EDDYSTONE | 1A | | | SULFURIC ACID | |
| **SODIUM CARBONATE** | | | | | |
| JIM BRIDGER | 4 | | POND | | |
| REID GARDNER | 1 | | LINED POND | | |
| REID GARDNER | 2 | | LINED POND | | |
| REID GARDNER | 3 | | LINED POND | | |
| **WELLMAN LORD** | | | | | |
| DEAN H. MITCHELL | 11 | | | ELEMENTAL SULFUR | |
| SAN JUAN | 1 | | | ELEMENTAL SULFUR | MARKETED |
| SAN JUAN | 2 | | | ELEMENTAL SULFUR | MARKETED |
| SAN JUAN | 3 | | | SULFURIC ACID | MARKETED |

## SECTION 9
## SUMMARY OF FGD SYSTEMS IN OPERATION

| COMPANY NAME/ UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/ SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| ALABAMA ELECTRIC COOP<br>TOMBIGBEE | 2 | NEW | 179.0 | LIMESTONE<br>PEABODY PROCESS SYSTEMS | 9/78 |
| ALABAMA ELECTRIC COOP<br>TOMBIGBEE | 3 | NEW | 179.0 | LIMESTONE<br>PEABODY PROCESS SYSTEMS | 6/79 |
| ALLEGHENY POWER SYSTEM<br>PLEASANTS | 1 | NEW | 519.0 | LIME<br>BABCOCK & WILCOX | 3/79 |
| ARIZONA ELECTRIC POWER COOP<br>APACHE | 2 | NEW | 195.0 | LIMESTONE<br>RESEARCH COTTRELL | 8/78 |
| ARIZONA ELECTRIC POWER COOP<br>APACHE | 3 | NEW | 195.0 | LIMESTONE<br>RESEARCH COTTRELL | 6/79 |
| ARIZONA PUBLIC SERVICE<br>CHOLLA | 1 | RETROFIT | 119.0 | LIMESTONE<br>RESEARCH COTTRELL | 10/73 |
| ARIZONA PUBLIC SERVICE<br>CHOLLA | 2 | NEW | 350.0 | LIMESTONE<br>RESEARCH COTTRELL | 4/78 |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS | 1 | RETROFIT | 175.0 | LIME/ALKALINE FLYASH<br>CHEMICO | 11/79 |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS | 2 | RETROFIT | 175.0 | LIME/ALKALINE FLYASH<br>CHEMICO | 11/79 |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS | 3 | RETROFIT | 229.0 | LIME/ALKALINE FLYASH<br>CHEMICO | 11/79 |
| BIG RIVERS ELECTRIC<br>GREEN | 1 | NEW | 242.0 | LIME<br>AMERICAN AIR FILTER | 12/79 |
| CENTRAL ILLINOIS LIGHT<br>DUCK CREEK | 1 | NEW | 378.0 | LIMESTONE<br>RILEY STOKER/ENVIRONEERING | 7/76 |
| CENTRAL ILLINOIS PUBLIC SERV<br>NEWTON | 1 | NEW | 617.0 | DUAL ALKALI<br>BUELL/ENVIROTECH | 9/79 |
| COLORADO UTE ELECTRIC ASSN.<br>CRAIG | 2 | NEW | 447.0 | LIMESTONE<br>PEABODY PROCESS SYSTEMS | 8/79 |
| COLUMBUS & SOUTHERN OHIO ELEC.<br>CONESVILLE | 5 | NEW | 411.0 | LIME<br>AIR CORRECTION DIVISION, UOP | 1/77 |
| COLUMBUS & SOUTHERN OHIO ELEC.<br>CONESVILLE | 6 | NEW | 411.0 | LIME<br>AIR CORRECTION DIVISION, UOP | 6/78 |
| COOPERATIVE POWER ASSOCIATION<br>COAL CREEK | 1 | NEW | 327.0 | LIME/ALKALINE FLYASH<br>COMBUSTION ENGINEERING | 8/79 |
| DUQUESNE LIGHT<br>ELRAMA | 1-4 | RETROFIT | 510.0 | LIME<br>CHEMICO | 10/75 |
| DUQUESNE LIGHT<br>PHILLIPS | 1-6 | RETROFIT | 410.0 | LIME<br>CHEMICO | 7/73 |
| INDIANAPOLIS POWER & LIGHT<br>PETERSBURG | 3 | NEW | 532.0 | LIMESTONE<br>AIR CORRECTION DIVISION, UOP | 12/77 |
| KANSAS CITY POWER & LIGHT<br>HAWTHORN | 3 | RETROFIT | 90.0 | LIME<br>COMBUSTION ENGINEERING | 11/72 |
| KANSAS CITY POWER & LIGHT<br>HAWTHORN | 4 | RETROFIT | 90.0 | LIME<br>COMBUSTION ENGINEERING | 8/72 |
| KANSAS CITY POWER & LIGHT<br>LA CYGNE | 1 | NEW | 874.0 | LIMESTONE<br>BABCOCK & WILCOX | 2/73 |
| KANSAS POWER & LIGHT<br>JEFFREY | 1 | NEW | 540.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 8/78 |

## SECTION 9
## SUMMARY OF FGD SYSTEMS IN OPERATION

| COMPANY NAME/<br>UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/<br>SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| KANSAS POWER & LIGHT<br>LAWRENCE | 4 | RETROFIT | 125.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 1/76 |
| KANSAS POWER & LIGHT<br>LAWRENCE | 5 | RETROFIT | 420.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 11/71 |
| KENTUCKY UTILITIES<br>GREEN RIVER | 1-3 | RETROFIT | 64.0 | LIME<br>AMERICAN AIR FILTER | 9/75 |
| LOUISVILLE GAS & ELECTRIC<br>CANE RUN | 4 | RETROFIT | 188.0 | LIME<br>AMERICAN AIR FILTER | 8/76 |
| LOUISVILLE GAS & ELECTRIC<br>CANE RUN | 5 | RETROFIT | 200.0 | LIME<br>COMBUSTION ENGINEERING | 12/77 |
| LOUISVILLE GAS & ELECTRIC<br>CANE RUN | 6 | RETROFIT | 299.0 | DUAL ALKALI<br>ADL/COMBUSTION EQUIP ASSOCIATE | 4/79 |
| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK | 3 | NEW | 442.0 | LIME<br>AMERICAN AIR FILTER | 8/78 |
| LOUISVILLE GAS & ELECTRIC<br>PADDY'S RUN | 6 | RETROFIT | 72.0 | LIME<br>COMBUSTION ENGINEERING | 4/73 |
| MINNKOTA POWER COOPERATIVE<br>MILTON R. YOUNG | 2 | NEW | 405.0 | LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE | 9/77 |
| MONTANA POWER<br>COLSTRIP | 1 | NEW | 360.0 | LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE | 9/75 |
| MONTANA POWER<br>COLSTRIP | 2 | NEW | 360.0 | LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE | 5/76 |
| NEVADA POWER<br>REID GARDNER | 1 | RETROFIT | 125.0 | SODIUM CARBONATE<br>ADL/COMBUSTION EQUIP ASSOCIATE | 4/74 |
| NEVADA POWER<br>REID GARDNER | 2 | RETROFIT | 125.0 | SODIUM CARBONATE<br>ADL/COMBUSTION EQUIP ASSOCIATE | 4/74 |
| NEVADA POWER<br>REID GARDNER | 3 | NEW | 125.0 | SODIUM CARBONATE<br>ADL/COMBUSTION EQUIP ASSOCIATE | 6/76 |
| NORTHERN INDIANA PUB SERVICE<br>DEAN H. MITCHELL | 11 | RETROFIT | 115.0 | WELLMAN LORD<br>DAVY POWERGAS | 7/76 |
| NORTHERN STATES POWER<br>SHERBURNE | 1 | NEW | 740.0 | LIMESTONE/ALKALINE FLYASH<br>COMBUSTION ENGINEERING | 3/76 |
| NORTHERN STATES POWER<br>SHERBURNE | 2 | NEW | 740.0 | LIMESTONE/ALKALINE FLYASH<br>COMBUSTION ENGINEERING | 4/77 |
| PACIFIC POWER & LIGHT<br>JIM BRIDGER | 4 | NEW | 550.0 | SODIUM CARBONATE<br>AIR CORRECTION DIVISION, UOP | 9/79 |
| PENNSYLVANIA POWER<br>BRUCE MANSFIELD | 1 | NEW | 917.0 | LIME<br>CHEMICO | 12/75 |
| PENNSYLVANIA POWER<br>BRUCE MANSFIELD | 2 | NEW | 917.0 | LIME<br>CHEMICO | 7/77 |
| PHILADELPHIA ELECTRIC<br>EDDYSTONE | 1A | RETROFIT | 120.0 | MAGNESIUM OXIDE<br>UNITED ENGINEERS | 9/75 |
| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN | 1 | RETROFIT | 361.0 | WELLMAN LORD<br>DAVY POWERGAS | 4/78 |
| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN | 2 | RETROFIT | 350.0 | WELLMAN LORD<br>DAVY POWERGAS | 8/78 |
| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN | 3 | NEW | 534.0 | WELLMAN LORD<br>DAVY POWERGAS | 12/79 |

## SECTION 9
## SUMMARY OF FGD SYSTEMS IN OPERATION

| COMPANY NAME/ UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/ SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| SALT RIVER PROJECT<br>CORONADO | 1 | NEW | 280.0 | LIMESTONE<br>PULLMAN KELLOGG | 11/79 |
| SOUTH CAROLINA PUBLIC SERVICE<br>WINYAH | 2 | NEW | 140.0 | LIMESTONE<br>BABCOCK & WILCOX | 7/77 |
| SOUTH MISSISSIPPI ELEC PWR<br>R.D. MORROW | 1 | NEW | 124.0 | LIMESTONE<br>RILEY STOKER/ENVIRONEERING | 8/78 |
| SOUTH MISSISSIPPI ELEC PWR<br>R.D. MORROW | 2 | NEW | 124.0 | LIMESTONE<br>RILEY STOKER/ENVIRONEERING | 6/79 |
| SOUTHERN ILLINOIS POWER COOP<br>MARION | 4 | NEW | 184.0 | LIMESTONE<br>BABCOCK & WILCOX | 5/79 |
| SOUTHERN INDIANA GAS & ELEC<br>A.B. BROWN | 1 | NEW | 265.0 | DUAL ALKALI<br>FMC | 4/79 |
| SPRINGFIELD CITY UTILITIES<br>SOUTHWEST | 1 | NEW | 194.0 | LIMESTONE<br>AIR CORRECTION DIVISION, UOP | 4/77 |
| ST. JOE ZINC<br>G.F. WEATON | 1 | RETROFIT | 60.0 | CITRATE<br>BUREAU OF MINES | 11/79 |
| TENNESSEE VALLEY AUTHORITY<br>SHAWNEE | 10A | RETROFIT | 10.0 | LIME/LIMESTONE<br>AIR CORRECTION DIVISION, UOP | 4/72 |
| TENNESSEE VALLEY AUTHORITY<br>SHAWNEE | 10B | RETROFIT | 10.0 | LIME/LIMESTONE<br>CHEMICO | 4/72 |
| TENNESSEE VALLEY AUTHORITY<br>WIDOWS CREEK | 8 | RETROFIT | 550.0 | LIMESTONE<br>TENNESSEE VALLEY AUTHORITY | 5/77 |
| TEXAS UTILITIES<br>MARTIN LAKE | 1 | NEW | 595.0 | LIMESTONE<br>RESEARCH COTTRELL | 4/77 |
| TEXAS UTILITIES<br>MARTIN LAKE | 2 | NEW | 595.0 | LIMESTONE<br>RESEARCH COTTRELL | 5/78 |
| TEXAS UTILITIES<br>MARTIN LAKE | 3 | NEW | 595.0 | LIMESTONE<br>RESEARCH COTTRELL | 2/79 |
| TEXAS UTILITIES<br>MONTICELLO | 3 | NEW | 800.0 | LIMESTONE<br>CHEMICO | 5/78 |
| UTAH POWER & LIGHT<br>HUNTER | 1 | NEW | 360.0 | LIME<br>CHEMICO | 5/79 |
| UTAH POWER & LIGHT<br>HUNTINGTON | 1 | NEW | 366.0 | LIME<br>CHEMICO | 5/78 |

## SECTION 10
## SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

| COMPANY NAME/ UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/ SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| ALLEGHENY POWER SYSTEM<br>PLEASANTS | 2 | NEW | 519.0 | LIME<br>BABCOCK & WILCOX | 9/80 |
| ARIZONA PUBLIC SERVICE<br>CHOLLA | 4 | NEW | 126.0 | LIMESTONE<br>RESEARCH COTTRELL | 6/80 |
| ASSOCIATED ELECTRIC COOP<br>THOMAS HILL | 3 | NEW | 670.0 | LIMESTONE<br>PULLMAN KELLOGG | 1/82 |
| BASIN ELECTRIC POWER COOP<br>ANTELOPE VALLEY | 1 | NEW | 440.0 | LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER | 4/82 |
| BASIN ELECTRIC POWER COOP<br>LARAMIE RIVER | 1 | NEW | 600.0 | LIMESTONE<br>RESEARCH COTTRELL | 4/80 |
| BASIN ELECTRIC POWER COOP<br>LARAMIE RIVER | 2 | NEW | 600.0 | LIMESTONE<br>RESEARCH COTTRELL | 11/80 |
| BASIN ELECTRIC POWER COOP<br>LARAMIE RIVER | 3 | NEW | 600.0 | LIME/SPRAY DRYING<br>BABCOCK & WILCOX | 4/82 |
| BIG RIVERS ELECTRIC<br>GREEN | 2 | NEW | 242.0 | LIME<br>AMERICAN AIR FILTER | 11/80 |
| CINCINNATI GAS & ELECTRIC<br>EAST BEND | 2 | NEW | 650.0 | LIME<br>BABCOCK & WILCOX | 9/80 |
| COLORADO UTE ELECTRIC ASSN.<br>CRAIG | 1 | NEW | 447.0 | LIMESTONE<br>PEABODY PROCESS SYSTEMS | 4/80 |
| COMMONWEALTH EDISON<br>POWERTON | 51 | RETROFIT | 450.0 | LIMESTONE<br>AIR CORRECTION DIVISION, UOP | 4/80 |
| COOPERATIVE POWER ASSOCIATION<br>COAL CREEK | 2 | NEW | 327.0 | LIME/ALKALINE FLYASH<br>COMBUSTION ENGINEERING | 7/80 |
| DELMARVA POWER & LIGHT<br>DELAWARE CITY | 1-3 | RETROFIT | 180.0 | WELLMAN LORD<br>DAVY MCKEE | 4/80 |
| EAST KENTUCKY POWER COOP<br>SPURLOCK | 2 | NEW | 500.0 | LIME<br>ADL/COMBUSTION EQUIP ASSOCIATE | 1/81 |
| HOOSIER ENERGY<br>MEROM | 2 | NEW | 441.0 | LIMESTONE<br>MITSUBISHI HEAVY INDUSTRIES | 7/81 |
| INDIANAPOLIS POWER & LIGHT<br>PETERSBURG | 4 | NEW | 530.0 | LIMESTONE<br>RESEARCH COTTRELL | 10/84 |
| KANSAS POWER & LIGHT<br>JEFFREY | 2 | NEW | 490.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 4/80 |
| LAKELAND UTILITIES<br>MCINTOSH | 3 | NEW | 364.0 | LIMESTONE<br>BABCOCK & WILCOX | 10/81 |
| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK | 1 | RETROFIT | 358.0 | LIME<br>COMBUSTION ENGINEERING | 4/81 |
| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK | 2 | RETROFIT | 350.0 | LIME<br>COMBUSTION ENGINEERING | 4/82 |
| LOUISVILLE GAS & ELECTRIC<br>MILL CREEK | 4 | NEW | 495.0 | LIME<br>AMERICAN AIR FILTER | 7/81 |
| MINNESOTA POWER & LIGHT<br>CLAY BOSWELL | 4 | NEW | 475.0 | LIME/ALKALINE FLYASH<br>PEABODY PROCESS SYSTEMS | 4/80 |
| MONTANA POWER<br>COLSTRIP | 3 | NEW | 700.0 | LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE | 1/84 |
| MONTANA POWER<br>COLSTRIP | 4 | NEW | 700.0 | LIME/ALKALINE FLYASH<br>ADL/COMBUSTION EQUIP ASSOCIATE | 0/84 |

## SECTION 10
## SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

| COMPANY NAME/<br>UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/<br>SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| NIAGARA MOHAWK POWER COOP<br>CHARLES R. HUNTLEY | 66 | RETROFIT | 100.0 | AQUEOUS CARBONATE<br>ROCKWELL INTERNATIONAL | 4/82 |
| NORTHERN STATES POWER<br>RIVERSIDE | 6,7 | RETROFIT | 110.0 | LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER | 7/80 |
| OTTER TAIL POWER<br>COYOTE | 1 | NEW | 440.0 | AQUEOUS CARBONATE/SPRAY DRYING<br>WHEELABRATOR-FRYE/R.I. | 3/81 |
| PENNSYLVANIA POWER<br>BRUCE MANSFIELD | 3 | NEW | 917.0 | LIME<br>PULLMAN KELLOGG | 10/80 |
| PHILADELPHIA ELECTRIC<br>EDDYSTONE | 1B | RETROFIT | 240.0 | MAGNESIUM OXIDE<br>UNITED ENGINEERS | 12/82 |
| PHILADELPHIA ELECTRIC<br>EDDYSTONE | 2 | RETROFIT | 334.0 | MAGNESIUM OXIDE<br>UNITED ENGINEERS | 12/82 |
| PUBLIC SERVICE OF NEW MEXICO<br>SAN JUAN | 4 | NEW | 534.0 | WELLMAN LORD<br>DAVY POWERGAS | 6/82 |
| SALT RIVER PROJECT<br>CORONADO | 2 | NEW | 280.0 | LIMESTONE<br>PULLMAN KELLOGG | 7/80 |
| SAN MIGUEL ELECTRIC COOP<br>SAN MIGUEL | 1 | NEW | 400.0 | LIMESTONE<br>BABCOCK & WILCOX | 9/80 |
| SIKESTON BOARD OF MUNIC. UTIL.<br>SIKESTON | 1 | NEW | 235.0 | LIMESTONE<br>BABCOCK & WILCOX | 1/81 |
| SOUTH CAROLINA PUBLIC SERVICE<br>WINYAH | 3 | NEW | 280.0 | LIMESTONE<br>BABCOCK & WILCOX | 5/80 |
| SPRINGFIELD WATER, LIGHT & PWR<br>DALLMAN | 3 | NEW | 205.0 | LIMESTONE<br>RESEARCH COTTRELL | 11/80 |
| TENNESSEE VALLEY AUTHORITY<br>PARADISE | 1 | RETROFIT | 704.0 | LIMESTONE<br>CHEMICO | 3/82 |
| TENNESSEE VALLEY AUTHORITY<br>PARADISE | 2 | RETROFIT | 704.0 | LIMESTONE<br>CHEMICO | 6/82 |
| TENNESSEE VALLEY AUTHORITY<br>WIDOWS CREEK | 7 | RETROFIT | 575.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 9/81 |
| TEXAS MUNICIPAL POWER AGENCY<br>GIBBONS CREEK | 1 | NEW | 400.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 1/82 |
| TEXAS POWER & LIGHT<br>SANDOW | 4 | NEW | 382.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 7/80 |
| UTAH POWER & LIGHT<br>HUNTER | 2 | NEW | 360.0 | LIME<br>CHEMICO | 6/80 |

## SECTION 11
## SUMMARY OF CONTRACT AWARDED FGD SYSTEMS

| COMPANY NAME/ UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/ SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| ALLEGHENY POWER SYSTEM<br>MITCHELL | 33 | RETROFIT | 300.0 | LIME<br>CHEMICO | 8/82 |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS | 4 | RETROFIT | 755.0 | LIME<br>UNITED ENGINEERS | 0/82 |
| ARIZONA PUBLIC SERVICE<br>FOUR CORNERS | 5 | RETROFIT | 755.0 | LIME<br>UNITED ENGINEERS | 0/82 |
| GRAND HAVEN BRD OF LIGHT & PWR<br>J. B. SIMS | 3 | NEW | 81.0 | LIME<br>BABCOCK & WILCOX | 6/83 |
| HOOSIER ENERGY<br>MEROM | 1 | NEW | 441.0 | LIMESTONE<br>MITSUBISHI HEAVY INDUSTRIES | 5/82 |
| HOUSTON LIGHTING & POWER CO.<br>W.A. PARISH | 8 | NEW | 492.0 | LIMESTONE<br>CHEMICO | 11/82 |
| MICHIGAN SO. CENTRAL PWR AGENC<br>PROJECT | 1 | NEW | 55.0 | LIMESTONE<br>BABCOCK & WILCOX | 7/82 |
| MUSCATINE POWER & WATER<br>MUSCATINE | 9 | NEW | 160.0 | LIMESTONE<br>RESEARCH COTTRELL | 9/82 |
| PHILADELPHIA ELECTRIC<br>CROMBY | | RETROFIT | 150.0 | MAGNESIUM OXIDE<br>UNITED ENGINEERS | 12/82 |
| PUBLIC SERVICE INDIANA<br>GIBSON | 5 | NEW | 650.0 | LIMESTONE<br>PULLMAN KELLOGG | 0/82 |
| SEMINOLE ELECTRIC<br>SEMINOLE | 1 | NEW | 620.0 | LIMESTONE<br>PEABODY PROCESS SYSTEMS | 3/83 |
| SEMINOLE ELECTRIC<br>SEMINOLE | 2 | NEW | 620.0 | LIMESTONE<br>PEABODY PROCESS SYSTEMS | 3/85 |
| SOUTH CAROLINA PUBLIC SERVICE<br>WINYAH | 4 | NEW | 280.0 | LIMESTONE<br>AMERICAN AIR FILTER | 7/81 |
| SOUTHWESTERN ELECTRIC POWER<br>HENRY W. PIRKEY | 1 | NEW | 720.0 | LIMESTONE<br>AIR CORRECTION DIVISION, UOP | 12/84 |
| TENNESSEE VALLEY AUTHORITY<br>JOHNSONVILLE | 1-10 | RETROFIT | 600.0 | MAGNESIUM OXIDE<br>RILEY ENVIRONEERING | 12/81 |
| TEXAS POWER & LIGHT<br>TWIN OAKS | 1 | NEW | 750.0 | LIMESTONE<br>CHEMICO | 8/84 |
| TEXAS POWER & LIGHT<br>TWIN OAKS | 2 | NEW | 750.0 | LIMESTONE<br>CHEMICO | 8/85 |
| TEXAS UTILITIES<br>MARTIN LAKE | 4 | NEW | 750.0 | LIMESTONE<br>RESEARCH COTTRELL | 0/85 |
| TUCSON ELECTRIC POWER<br>SPRINGERVILLE | 1 | NEW | 370.0 | LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER | 6/85 |
| TUCSON ELECTRIC POWER<br>SPRINGERVILLE | 2 | NEW | 370.0 | LIME/SPRAY DRYING<br>JOY MFG/NIRO ATOMIZER | 1/87 |
| UNITED POWER ASSOCIATION<br>STANTON | 2 | NEW | 50.0 | LIME/SPRAY DRYING<br>KOMLINE & SANDERSON | 1/82 |
| UTAH POWER & LIGHT<br>HUNTER | 3 | NEW | 400.0 | LIMESTONE<br>CHEMICO | 0/83 |
| UTAH POWER & LIGHT<br>HUNTER | 4 | NEW | 400.0 | LIMESTONE<br>CHEMICO | 0/85 |

## SECTION 12
## SUMMARY OF PLANNED FGD SYSTEMS

| COMPANY NAME/ UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/ SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| LETTER OF INTENT SIGNED | | | | | |
| NORTHERN INDIANA PUB SERVICE<br>SCHAHFER | 17 | NEW | 421.0 | DUAL ALKALI<br>FMC | 6/83 |
| NORTHERN INDIANA PUB SERVICE<br>SCHAHFER | 18 | NEW | 421.0 | DUAL ALKALI<br>FMC | 6/85 |
| REQUESTING/EVALUATING BIDS | | | | | |
| BASIN ELECTRIC POWER COOP<br>ANTELOPE VALLEY | 2 | NEW | 440.0 | LIME/SPRAY DRYING<br>VENDOR NOT SELECTED | 4/84 |
| CENTRAL ILLINOIS LIGHT<br>DUCK CREEK | 2 | NEW | 416.0 | LIMESTONE<br>VENDOR NOT SELECTED | 1/86 |
| DESERET GENERATION & TRANS COO<br>MOON LAKE | 1 | NEW | 410.0 | LIMESTONE<br>VENDOR NOT SELECTED | 12/84 |
| DESERET GENERATION & TRANS COO<br>MOON LAKE | 2 | NEW | 410.0 | LIMESTONE<br>VENDOR NOT SELECTED | 0/88 |
| MIDDLE SOUTH UTILITIES<br>ARKANSAS COAL | 5 | NEW | 890.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 1/86 |
| MIDDLE SOUTH UTILITIES<br>ARKANSAS COAL | 6 | NEW | 890.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 1/88 |
| MIDDLE SOUTH UTILITIES<br>LOUISIANA COAL | 1 | NEW | 890.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/86 |
| MIDDLE SOUTH UTILITIES<br>LOUISIANA COAL | 2 | NEW | 890.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/88 |
| MIDDLE SOUTH UTILITIES<br>MISSISSIPPI COAL | 1 | NEW | 890.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/85 |
| MIDDLE SOUTH UTILITIES<br>MISSISSIPPI COAL | 2 | NEW | 890.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/87 |
| NEVADA POWER<br>REID GARDNER | 4 | NEW | 250.0 | SODIUM CARBONATE<br>VENDOR NOT SELECTED | 4/83 |
| NEW YORK STATE ELEC & GAS<br>SOMERSET | 1 | NEW | 870.0 | LIMESTONE<br>VENDOR NOT SELECTED | 6/84 |
| NORTHERN STATES POWER<br>SHERBURNE | 3 | NEW | 860.0 | LIMESTONE<br>COMBUSTION ENGINEERING | 5/84 |
| TAMPA ELECTRIC<br>BIG BEND | 4 | NEW | 475.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 3/85 |
| TEXAS UTILITIES<br>FOREST GROVE | 1 | NEW | 750.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/81 |
| CONSIDERING FGD SYSTEMS | | | | | |
| BIG RIVERS ELECTRIC<br>D. B. WILSON | 1 | NEW | 440.0 | LIME<br>VENDOR NOT SELECTED | 0/84 |
| BIG RIVERS ELECTRIC<br>D. B. WILSON | 2 | NEW | 440.0 | LIME<br>VENDOR NOT SELECTED | 0/85 |
| CENTRAL MAINE POWER<br>SEARS ISLAND | 1 | NEW | 600.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 1/89 |
| CINCINNATI GAS & ELECTRIC<br>EAST BEND | 1 | NEW | 650.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/ 0 |
| COLORADO UTE ELECTRIC ASSN.<br>CRAIG | 3 | NEW | 447.0 | LIME/SPRAY DRYING<br>VENDOR NOT SELECTED | 0/82 |

## SECTION 12
## SUMMARY OF PLANNED FGD SYSTEMS

| COMPANY NAME/ UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/ SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| COLUMBUS & SOUTHERN OHIO ELEC.<br>POSTON | 5 | NEW | 375.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 5/86 |
| COLUMBUS & SOUTHERN OHIO ELEC.<br>POSTON | 6 | NEW | 375.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/89 |
| DELMARVA POWER & LIGHT<br>VIENNA | 9 | NEW | 550.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 6/87 |
| EAST KENTUCKY POWER COOP<br>J. K. SMITH | 1 | NEW | 650.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 1/85 |
| EAST KENTUCKY POWER COOP<br>J. K. SMITH | 2 | NEW | 650.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 1/87 |
| GENERAL PUBLIC UTILITIES<br>COHO | 1 | NEW | 800.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 12/86 |
| GENERAL PUBLIC UTILITIES<br>GILBERT | 1 | NEW | 625.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/90 |
| GENERAL PUBLIC UTILITIES<br>SCOTTSVILLE | 1 | NEW | 625.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/91 |
| GENERAL PUBLIC UTILITIES<br>SEWARD | 7 | NEW | 800.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 5/87 |
| GENERAL PUBLIC UTILITIES<br>WEHRUM | 1 | NEW | 625.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/95 |
| INDIANAPOLIS POWER & LIGHT<br>PATRIOT | 1 | NEW | 650.0 | LIMESTONE<br>VENDOR NOT SELECTED | 0/87 |
| INDIANAPOLIS POWER & LIGHT<br>PATRIOT | 2 | NEW | 650.0 | LIMESTONE<br>VENDOR NOT SELECTED | 0/87 |
| INDIANAPOLIS POWER & LIGHT<br>PATRIOT | 3 | NEW | 650.0 | LIMESTONE<br>VENDOR NOT SELECTED | 0/87 |
| LOUISVILLE GAS & ELECTRIC<br>TRIMBLE COUNTY | 1 | NEW | 575.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 7/84 |
| LOUISVILLE GAS & ELECTRIC<br>TRIMBLE COUNTY | 2 | NEW | 575.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 7/86 |
| NEVADA POWER<br>HARRY ALLEN | 1 | NEW | 500.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 6/86 |
| NEVADA POWER<br>HARRY ALLEN | 2 | NEW | 500.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 6/87 |
| NEVADA POWER<br>HARRY ALLEN | 3 | NEW | 500.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 6/88 |
| NEVADA POWER<br>HARRY ALLEN | 4 | NEW | 500.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 6/89 |
| NEVADA POWER<br>WARNER VALLEY | 1 | NEW | 250.0 | LIME<br>VENDOR NOT SELECTED | 6/85 |
| NEVADA POWER<br>WARNER VALLEY | 2 | NEW | 250.0 | LIME<br>VENDOR NOT SELECTED | 6/86 |
| PACIFIC GAS & ELECTRIC<br>MONTEZUMA | 1 | NEW | 800.0 | LIMESTONE<br>VENDOR NOT SELECTED | 6/87 |
| PACIFIC GAS & ELECTRIC<br>MONTEZUMA | 2 | NEW | 800.0 | LIMESTONE<br>VENDOR NOT SELECTED | 6/88 |
| POTOMAC ELECTRIC POWER<br>DICKERSON | 4 | NEW | 800.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 5/87 |

## SECTION 12
## SUMMARY OF PLANNED FGD SYSTEMS

| COMPANY NAME/<br>UNIT NAME | UNIT NO. | NEW OR RETROFIT | CAPACITY MW | PROCESS/<br>SYSTEM SUPPLIER | START-UP DATE |
|---|---|---|---|---|---|
| PWR AUTHORITY OF STATE OF NY<br>FOSSIL | | NEW | 700.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 11/87 |
| SALT RIVER PROJECT<br>CORONADO | 3 | NEW | 280.0 | LIMESTONE<br>VENDOR NOT SELECTED | 6/87 |
| SOUTHERN ILLINOIS POWER COOP<br>MARION | 5 | NEW | 300.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/86 |
| TEXAS UTILITIES<br>MILL CREEK | 1 | NEW | 750.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/85 |
| TEXAS UTILITIES<br>MILL CREEK | 2 | NEW | 750.0 | PROCESS NOT SELECTED<br>VENDOR NOT SELECTED | 0/86 |

## SECTION 13

## TOTAL FGD UNITS AND CAPACITY (MW) INSTALLED BY YEAR

| | NEW ON LINE | | TERMINATED | | TOTAL ON LINE | |
|---|---|---|---|---|---|---|
| YEAR | NO. | MW | NO. | MW | NO. | MW |
| 1968 | 1 | 140. | 0 | 0. | 1 | 140. |
| 1969 | 0 | 0. | 1 | 140. | 0 | 0. |
| 1971 | 4 | 702. | 0 | 0. | 4 | 702. |
| 1972 | 8 | 518. | 0 | 0. | 12 | 1220. |
| 1973 | 8 | 1938. | 1 | 175. | 19 | 2983. |
| 1974 | 3 | 606. | 3 | 340. | 19 | 3250. |
| 1975 | 6 | 2018. | 3 | 1637. | 22 | 3631. |
| 1976 | 8 | 2786. | 3 | 850. | 27 | 5567. |
| 1977 | 11 | 4684. | 1 | 47. | 37 | 10204. |
| 1978 | 13 | 4736. | 0 | 0. | 50 | 14940. |
| 1979 | 20 | 6356. | 1 | 23. | 69 | 21273. |
| 1980 | 20 | 8040. | 0 | 0. | 89 | 29313. |
| 1981 | 11 | 5038. | 0 | 0. | 100 | 34351. |
| 1982 | 22 | 9331. | 0 | 0. | 122 | 43682. |
| 1983 | 5 | 1772. | 0 | 0. | 127 | 45454. |
| 1984 | 11 | 6995. | 0 | 0. | 138 | 52449. |
| 1985 | 12 | 6766. | 0 | 0. | 150 | 59215. |
| 1986 | 9 | 4946. | 0 | 0. | 159 | 64161. |
| 1987 | 13 | 8290. | 0 | 0. | 172 | 72451. |
| 1988 | 6 | 4290. | 0 | 0. | 178 | 76741. |
| 1989 | 3 | 1475. | 0 | 0. | 181 | 78216. |
| 1990 | 1 | 625. | 0 | 0. | 182 | 78841. |
| 1991 | 1 | 625. | 0 | 0. | 183 | 79466. |
| 1995 | 1 | 625. | 0 | 0. | 184 | 80091. |
| UNDEFINED | 12 | 2612. | | | | |

## SECTION 14

## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                        COMMONWEALTH EDISON
PLANT NAME                                          WILL COUNTY
UNIT NUMBER                                         1
CITY                                                ROMEOVILLE
STATE                                               ILLINOIS
REGULATORY CLASSIFICATION                           ******
PARTICULATE EMISSION LIMITATION - NG/J                86.          (  .200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                       774.          ( 1.800 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  1147.0
GROSS UNIT GENERATING CAPACITY - MW                  167.0
NET UNIT GENERATING CAPACITY W/FGD - MW              137.0
NET UNIT GENERATING CAPACITY WO/FGD - MW            *******
EQUIVALENT SCRUBBED CAPACITY - MW                   *******

** BOILER DATA
    SUPPLIER                                        BABCOCK & WILCOX
    TYPE                                            CYCLONE
    SERVICE LOAD                                    CYCLIC
    COMMERCIAL SERVICE DATE                          0/55
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S             363.36       ( 770000 ACFM)
    FLUE GAS TEMPERATURE - C                          179.4        ( 355 F)
    STACK HEIGHT - M                                  107.         ( 350 FT)
    STACK TOP DIAMETER - M                              3.8        ( 12.4 FT)

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      ******
    AVERAGE HEAT CONTENT - J/G                       22260.        (  9570 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                     9,100 - 10,500
    AVERAGE ASH CONTENT - %                              7.40
    RANGE ASH CONTENT - %                           3 - 16
    AVERAGE MOISTURE CONTENT - %                    ********
    RANGE MOISTURE CONTENT - %                      ******
    AVERAGE SULFUR CONTENT - %                           1.50
    RANGE SULFUR CONTENT - %                        0.3 - 4.5
    AVERAGE CHLORIDE CONTENT - %                    ********
    RANGE CHLORIDE CONTENT - %                      ******

** ESP
    NUMBER                                           1
    TYPE                                            COLD SIDE
    SUPPLIER                                        WESTERN PRECIPITATION
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          79.0
    FLUE GAS TEMPERATURE - C                          179.4        (  355 F)

** PARTICULATE SCRUBBER
    NUMBER                                           2
    TYPE                                            VENTURI
    SUPPLIER                                        BABCOCK & WILCOX
    SHELL MATERIAL                                  CARBON STEEL
    LINING MATERIAL                                 PLASITE AND KAOCRETE
    TYPE OF NOZZLES                                 STAINLESS STEEL
    FLUE GAS CAPACITY - CU.M/S                        181.7        ( 385000 ACFM)
    FLUE GAS TEMPERATURE - C                          179.4        (  355 F)
    LIQUID RECIRCULATION RATE - LITER/S               365.4        ( 5800 GPM)
    L/G RATIO - LITER/CU.M                              2.4        (18.0 GAL/1000ACF)
    PRESSURE DROP - KPA                             *******        (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                     36.6        (  120.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                      .4        (    .16 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          98.0


---------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 3/75  A             94.0        99.2                     81.2
       B               .0          .0                       .0
       SYSTEM                                                                744   609
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COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

         ** PROBLEMS/SOLUTIONS/COMMENTS
                              A VENTURI HOSE LEAK FORCED MODULE A OUT ONCE.
                              MODULE B WAS OUT OF SERVICE TWICE FOR NO DEMAND AND ONCE AS A RESULT OF AN
                              ACCIDENTAL 50 MINUTE TRIP.
                              COAL BURNED THIS MONTH AVERAGED LESS THAN ONE PERCENT SULFUR.

 4/75  A          37.0         39.5                     35.0
       B            .0           .0                       .0
       SYSTEM                                                                     720   638

         ** PROBLEMS/SOLUTIONS/COMMENTS
                              CHICAGO FLY ASH IS TREATING MATERIAL FROM THE SCRUBBER WITH LIME AND FLY
                              ASH AND DUMPING IT INTO THE HOLDING BASIN.
                              A BOILER OUTAGE FORCED MODULE A OUT OF SERVICE ONCE THIS MONTH (MODULE B
                              WAS ALREADY OUT OF SERVICE).
                              COAL BURNED THIS MONTH WAS RECLAIM COAL AND VARIED IN SULFUR CONTENT.

 5/75  A          84.5         84.5                     84.5
       B          37.1         37.1                     37.1
       SYSTEM                                                                     744   744

         ** PROBLEMS/SOLUTIONS/COMMENTS
                              MODULE B WAS IN SERVICE ON MAY 20 FOR THE FIRST TIME SINCE APRIL 13, 1973.
                              RECIRCULATION TANK MIXERS.
                              MODULE A (WHICH WAS THE ONLY ONE OPERATING) WAS FORCED OUT TWICE IN APRIL
                              TO AVOID POND OVERBOARDING INTO THE DES PLAINES RIVER. THE SECOND OUTAGE
                              LASTED UNTIL MAY 5. DURING THE PAST SEVERAL MONTHS OF GENERALLY CONTINUOUS
                              OPERATION OF MODULE A. IT HAS BECOME APPARENT THAT THE PRESENT LIQUID
                              CIRCULATING SYSTEM CANNOT BE OPERATED IN A CONTINUOUSLY CLOSED CYCLE. THE
                              WATER IMBALANCE POSES A HIGH RISK OF OVERBOARDING FROM THE SLUDGE POND
                              DURING LONG PERIODS OF SUSTAINED OPERATON. THE FOLLOWING REVISIONS HAVE
                              BEEN MADE TO REDUCE THE WATER IMBALANCE:
                                   1. THE PUMP GLAND WATER FLOWS HAVE BEEN CUT FROM 10 GPM TO 5 GPM.
                                   2. THE SCRUBBER HOUSE SERVICE WATER FILTER BACKWASH HAS BEEN ROUTED
                                      OUT OF THE SYSTEM.
                                   3. THE CONTINUOUS UNDERSPRAY HAS BEEN CHANGED TO AN INTERMITTENT
                                      SPRAY 5 MINUTES ON, 5 MINUTES OFF.
                              THE THICKENER HAS BEEN DOWN SINCE APRIL 21 DUE TO A BROKEN GEAR AND A STUCK
                              SWEEP ARM. THE THICKENER HAS BEEN BYPASSED AND THE SLUDGE IS GOING TO THE
                              POND.
                              DURING MAY, MODULE A WAS OUT FOR 45 MINUTES DUE TO A DAMPER TRIP.
                              MODULE A WAS OUT ONCE FOR SPRAY NOZZLE CLEANING.
                              MODULE B WAS OUT TWICE AFTER START UP, ONCE FOR A VENTURI PUMP TRIP AND
                              ONCE FOR A RECIRCULATION TANK LEVEL TRIP.
                              CHICAGO FLY ASH IS TREATING THE MATERIAL FROM THE SCRUBBER WITH LIME AND
                              FLY ASH AND DUMPING IT INTO THE HOLDING BASIN. A MIXER HAS BEEN INSTALLED
                              AT THE THICKENER, WHICH ENABLES THEM TO SUBSTITUTE SEALED DUMP TRUCKS FOR
                              THE CEMENT TRUCKS WHICH WERE USED IN THE PAST FOR MIXING AND TRANSPORTING
                              THE WASTE MATERIAL TO THE HOLDING BASIN.
                              COAL BURNED THIS MONTH VARIED GREATLY IN SULFUR CONTENT, RANGING FROM LOW
                              SULFUR WESTERN COAL TO HIGH SULFUR ILLINOIS COAL.

 6/75  A          64.1         60.6                     54.1
       B          85.5         84.6                     75.4
       SYSTEM                                                                     720   642

         ** PROBLEMS/SOLUTIONS/COMMENTS
                              A REHEATER PLUGGAGE INSPECTION FORCED ONE MODULE A OUTAGE.
                              A LOW LEVEL TRIP CAUSED A 35 MINUTE OUTAGE, AND NO DEMAND ACCOUNTED FOR TWO
                              MORE MODULE A OUTAGES.
                              MODULE B WAS OUT FOR 95 HOURS TO CLEAN THE BOOSTER FAN AND DEMISTER.
                              HIGH BOOSTER FAN VIBRATIONS CAUSED MODULE B TO SHUT DOWN ON JUNE 30.
                              DURING THIS MONTH HIGH SULFUR COAL WAS BURNED IN A TWO WEEK TEST, AND LOW
                              SULFUR COAL WAS BURNED THE REST OF THE MONTH.

 7/75  A            .0           .0                       .0
       B          79.2         79.4                     73.5
       SYSTEM                                                                     744   689
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EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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-----------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                               SO2 PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         CHICAGO FLY ASH IS TREATING THE SCRUBBER WASTE MATERIAL WITH LIME AND FLY
                         ASH AND DUMPING IT INTO THE ON SITE HOLDING BASIN. THE MATERIAL FROM THE
                         HOLDING BASIN IS BEING TRUCKED TO AN OFF SITE DUMP.
                         MODULE B WAS OUT ONCE (30 MINUTES) TO REPAIR A MINOR STEAM HEADER LEAK.
                         MODULE B WAS OUT ONCE DUE TO NO DEMAND.
                         LOW SULFUR COAL WAS BURNED MOST OF THIS MONT, WITH HIGH SULFUR COAL BEING
                         BURNED DURING THE LAST WEEK OF THE MONTH.

8/75   A             .0          .0                      .0
       B           93.5       100.0                    76.4
       SYSTEM                                                               744   565

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         IN JUNE, MODULE A ENCOUNTERED PLUGGAGE IN THE DEMISTER, WHICH REQUIRED ITS
                         REPLACEMENT. THE WORK WAS COMPLETED IN AUGUST.
                         MODULE A WENT OUT OF SERVICE ON JUNE 20 AND REMAINED OUT THROUGH AUGUST DUE
                         TO MASSIVE REHEATER LEAKS. THERE IS PRESENTLY A HOLD ON THE NEW REHEATER
                         ORDER BECAUSE OF MATERIAL FAILURES EXPERIENCED IN MODULE B'S CARBON STEEL
                         REHEATER.
                         MODULE B SUFFERED TWO OUTAGES IN JULY AND ONE IN AUGUST BECAUSE OF REHEATER
                         TUBE LEAKS. THE FAILURES WERE DUE TO VIBRATION FATIGUE. THE REHEATER, WHICH
                         WAS INSTALLED IN MAY, HAS LOST SIX OF ITS TWELVE TUBE BUNDLES SO FAR. THE
                         LENGTH OF TIME THAT THE TUBES HAVE LASTED WOULD SEEM TO INDICATE THAT THERE
                         IS A DIESIGN RELATED MATERIAL DEFICIENCY. THREE OF THE TUBE BUNDLES WERE
                                REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.
                         A SMALL STEAM HEADER LEAK CAUSED ONE MODULE B OUTAGE.
                         MODULE B WAS OUT FOUR TIMES FOR NO DEMAND AND ONCE FOR A LOW FLOW TRIP.
                         HIGH SULFUR COAL WAS BURNED ALL MONTH, CAUSING AN INCREASE IN SLUDGE
                         PRODUCTION WHICH HAS FORCED A MINIMUM SIX DAY A WEEK, TEN HOUR A DAY
                         SLUDGE DISPOSAL OPERATION. THE SLUDGE IS BEING TREATED WITH LIME AND
                         FLY ASH AND BEING DUMPED INTO THE ON SITE HOLDING POND. STABILIZED
                         MATERIAL IS BEING TRUCKED FROM THE POND TO AN OFF SITE DISPOSAL AREA.

9/75   A
       B
       SYSTEM                                                               720

10/75  A             .0          .0                      .0
       B           32.3       100.0                    26.6
       SYSTEM                                                               744   194

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         MODULE A WAS OFF THE ENTIRE 11 DAYS THE BOILER OPERATED THIS MONTH, WAITING
                         FOR ITS NEW REHEATER, WHICH HAS NOW BEEN RELEASED FOR MANUFACTURING BY
                         SMED.
                         MODULE B HAD TWO OUTAGES, ONE FOR NO DEMAND AND ONE MINOR 15 MINUTE TRIP.
                         HIGH SULFUR COAL WAS BURNED THIS MONTH WHEN THE SCRUBBER WAS IN SERVICE.
                         THE SLUDGE IS BEING TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE
                         DISPOSAL AREA.

11/75  A             .0                                  .0
       B             .0                                  .0
       SYSTEM                                                               720     0

12/75  A             .0                                  .0
       B             .0                                  .0
       SYSTEM                                                               744     0

1/76   A             .0                                  .0
       B             .0                                  .0
       SYSTEM                                                               744     0

2/76   A             .0                                  .0
       B             .0                                  .0
       SYSTEM                                                               696     0

3/76   A           30.1        45.2                    18.8
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PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | 8.8 | 20.4 | | 8.5 | | | | | | |
| | SYSTEM | | | | | | | 744 | 309 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FROM OCTOBER 11 THROUGH MARCH 19 FOR ITS BOILER TURBINE AND SCRUBBER OVERHAUL. THE MAJOR ITEMS TO BE ACCOMPLISHED DURING THE OUTAGE WERE:

1. SIMPLIFICATION OF THE MILLING SYSTEM CONTROL.
2. PULLING AND CLEANING OF THE MODULE B REHEATER AND RETURNING IT REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.
3. CLEANING OF THE POND PUMP BAY.
4. REMOVAL OF THE VENTURI AND ABSORBER PUMP CHECK VALVES (ONE OF THEM FAILED LAST SPRING AND DESTROYED A PUMP LINER AND IMPELLER).
5. CLEANING AND REPAIR OF THE VENTURI NOZZLES AND SUPPORTS.
6. REPAIR OF CORRODED REHEATER SUPPORTS.
7. RESETTING AND ADJUSTMENT OF ALL DAMPERS.
8. REVISION OF SCRUBBER CONTROLS BY REMOVING THE CONTROLS NO LONGER USED OR NEEDED.
9. INSPECTION AND CLEANING OF THE ENTIRE SCRUBBER AND RELATED EQUIPMENT.

MODULE A WAS PUT INTO THE GAS PATH ON MARCH 22 AND REMAINED AVAILABLE FOR SERVICE THE REST OF THE MONTH.

MODULE B HAD TO REMAIN OUT OF SERVICE UNTIL MARCH 29 WHILE ITS REPAIRED REHEATER WAS INSTALLED.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/76 | A | 23.0 | 20.0 | | 19.2 | | | | | | |
| | B | | 49.3 | | 47.3 | | | | | | |
| | SYSTEM | | | | | | | 720 | 691 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 RETURNED TO SERVICE APRIL 2 AFTER A SHORT TURBINE CONTROL OUTAGE.

BOTH MODULES CAME ON LINE JUST BEFORE THE BOILER.

A FIVE DAY OUTAGE OF MODULE B WAS DUE TO REHEATER TUBE BUNDLE LEAKS.

SEVERAL MODULE B OUTAGES WERE DUE TO PLUGGED ABSORBER TANK SCREENS CAUSED BY MILL AND CLASSIFIER FAILURES WHICH ALLOWED ROCK TO GET INTO THE SYSTEM.

MODULE B WAS THOROUGHLY CLEANED.

ONLY ONE ABSORBER PUMP IS BEING USED IN MODULE B, SINCE THE 1B2 PUMP LINER FAILED AS A RESULT OF A BROKEN DISCHARGE VALVE. A REPLACEMENT LINER IS BEING INSTALLED.

A SCRUBBER TESTING AND EVALUATING PROGRAM WAS STARTED THIS MONTH. MUCH OF THE LATTER TWO WEEKS OF THE MONTH WERE SPENT TRAINING THE TESTING PERSONNEL. THE PROGRAM WILL PROVIDE CHEMISTRY DATA AND OPERATING CHARACTERISTICS

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/76 | A | .0 | .0 | | .0 | | | | | | |
| | SYSTEM | | | | | | | 744 | 665 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

A VENTRUI HOSE LEAK FORCED MODULE B OFF ONCE THIS MONTH.

MODULE B WAS TAKEN OUT OF SERVICE ONCE BECAUSE OF A PLUGGED ABSORBER TANK SCREEN.

MODULE B WAS OFF ONCE DUE TO A FOULED I.D. FAN.

MODULE B WAS OUT OF THE GAS PATH ONCE DUE TO NO DEMAND.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/76 | A | 52.0 | 44.2 | | 37.6 | | | | | | |
| | B | 86.2 | 84.5 | | 71.9 | | | | | | |
| | SYSTEM | | | | | | | 720 | 612 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A SUFFERED VENTURI PUMP LINER FAILURES ON APRIL 78 WHEN AN INLET 16 INCH BUTTERFLY ISOLATION VALVE BROKE APART AND FELL INTO THE VENTURI PUMP. BOTH THE A AND BACKUP AB VENTURI PUMP LINERS WERE DESTROYED. MODULE A REMAINED OUT SERVICE UNITL JUNE 9, WHEN THE LINERS WERE REPLACED.

MODULE A WAS OFF ONCE FOR SHEARED BYPASS DAMPER PINS.

I.D. BOOSTER FAN FOULING FORCED MODULE A OFF ONCE THIS MONTH FOR ABOUT 164 HOURS.

BOTH MODULES WERE OFF TWICE DUE TO NO DEMAND. DURING THESE OUTAGES, THE DEMISTERS WERE WASHED AND ABSORBER TRAY SCALE, IF ANY, WAS KNOCKED OFF.

MODULE B WAS OUT OF THE GAS PATH FOR SEVERAL SHORT VENTURI LOW FLOW TRIP OUTAGES DUE TO A PLUGGED, SCALED VENTURI TANK SCREEN. AT THE END OF THE MONTH, THE MODULE WAS TAKEN OUT TO CLEAN THE SCREEN.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

----------------------------------------PERFORMANCE DATA----------------------------------------

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|

THE MODULE B I.D. BOOSTER FAN REQUIRED CLEANING DURING THE MONTH.
THE REHEATER TUBES ARE SCALING, WHICH RESULTS IN A LOWER HEAT TRANSFER RATE RATE, AND THEREFORE INCREASES I.D. BOOSTER FAN FOULING. THE ONLY WAY TO CLEAN THE REHEATERS EFFECTIVELY IS TO REMOVE THEM, WHICH DEMANDS A SUBSTANTIAL OUTAGE.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/76 | A | 19.9 | .0 | | .0 | | | | | | |
| | B | 86.2 | 90.0 | | 72.3 | | | | | | |
| | SYSTEM | | | | | | | 744 | 598 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OFF THE FIRST PART OF THE MONTH DURING REPAIRS TO THE ABSORBER THE LATTER PART OF THE MONTH THE MODULE WAS READY FOR SERVICE BUT WAS NOT OPERATED BECAUSE OF THICKENER-POND SLUDGE OVERLOADING.
MODULE B WAS FORCED OFF ONCE TO BALANCE THE I.D. BOOSTER FAN, AND ONCE TO WASH THE FAN.
MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/76 | A | 98.2 | 57.6 | | 39.3 | | | | | | |
| | B | 65.4 | 61.4 | | 40.9 | | | | | | |
| | SYSTEM | | | | | | | 744 | 495 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF THE GAS PATH THE FIRST HALF OF THE MONTH T AVOID THICKENER-POND OVERLOADING.
DURING THE LATTER HALF OF THE MONTH, MODULE A WAS USED WITH THREE MINOR FORCED OUTAGES AND ONE FOUR DAY NO DEMAND OUTAGE.
MODULE B WAS OUT OF THE GAS PATH THREE TIMES DUE TO NO DEMAND.
LOSS OF CHEMICAL CONTROL CAUSED TWO MODULE A OUTAGES.
MODULE B WAS OFF FOR NINE DAYS DUE TO FOULING.
SPENT SLURRY VALVE REPAIRS FORCED A MODULE B OUTAGE.
ON AUGUST 12 THE OPERATING PH CONTROL SET POINT WAS REDUCED FROM 5.4 TO 5.1. IT IS BELIEVED THAT THIS LOWER PH IS THE CAUSE OF THE FOULING OUTAGE OF MODULE B ON AUGUST 21. MODULE A WAS ALSO OPERATED FOR THREE DAYS, AND IT, TOO, EXPERIENCED INCREASED SACLE FOULING. THE PH SET POINT WAS THEN INCREASED BACK TO 5.4.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/76 | A | 42.3 | 28.7 | | 22.6 | | | | | | |
| | B | 79.4 | | | 59.9 | | | | | | |
| | SYSTEM | | | | | | | 720 | 566 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WENT OFF ONCE DUE TO A LOW FLOW TRIP.
MODULE A WAS TAKEN OFF ONCE FOR CLEANING OF THE RECIRCULATION TANK AND PUMPS, AND INSPECTION OF PUMP ISOLATION VALVES.
A LINER LEAK IN 1A2 ABOSORBER PUMP ALSO FORCED MODULE A OFF.
MODULE A WAS OUT OF TH GAS PATH TWICE DUE TO NO DEMAND.
MODULE A WAS TAKEN OFF ONCE TO AVOID THICKENER-POND OVERLOADING.
SPENT SLURRY VALVE TROUBLE CAUSED TWO MODULE B OUTAGES.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/76 | A | 27.9 | 28.9 | | 37.9 | | | | | | |
| | B | 76.4 | 56.2 | | 54.8 | | | | | | |
| | SYSTEM | | | | | | | 744 | 726 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH SULFUR ILLINOIS COAL WAS BURNED IN THE BOILER FROM MARCH THROUGH OCTOBER.
THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE DISPOSAL AREA.
MODULE A OPERATED ON ONE ABSORBER PUMP, ALLOWING TESTING ON A LOWER ABSORBER FAN.
MODULE A WAS OUT OF THE GAS PATH ONCE FOR AN I.D. BOBOOSTER FAN TRIP.
WORK ON RECIRCULATION TANK LEVEL CONTROLS CAUSED A MODULE A OUTAGE.
MODULE B WAS FORCED OFF ONCE TO REPAIR A REHEATER HEADER LEAK.
ONE MODULE B OUTAGE WAS FOR VENTURI NOZZLE CLEANING.
MODULE B WENT OFF FOR A VENTURI LOW FLOW TRIP.
MODULE B REMAINED OUT OF SERVICE WHILE MODULE A WAS BEING TESTED TO AVOID THICKENER-POND OVERLOADING.
A VACUUM FILTER WAS TIED IN AT THE THICKENER.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL | | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |
| 11/76 | A | 20.1 | 25.6 | | 20.1 | | | | | | |
| | B | 72.2 | 69.6 | | 4.7 | | | | | | |
| | SYSTEM | | | | | | | 720 | 566 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A OPERATED ON ONE ABSORBER PUMP DURING MODULE B OUTAGE.
MODULE B WAS FORCED OUT OF THE GAS PATH ONCE FOR A MILLING SYSTEM FAILURE.
MODULE B ENCOUNTERED A VENTURI HEADER LEAK.
THE VENTURI NOZZLES REQUIRED CLEANING DURING THE MONTH.
REPLACEMENT OF THE SPENT SLURRY VALVE NECESSITATED A MODULE OUTAGE.
MODULE B WAS OFF ONCE DUE TO A CHEMICAL SYSTEM UPSET.
MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND (MODULE A WAS NOT IN SERVICE AT THE TIME OF THE OUTAGE).

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/76 | A | 44.9 | 48.3 | | 44.9 | | | | | | |
| | B | 53.4 | 51.7 | | 48.0 | | | | | | |
| | SYSTEM | | | | | | | 744 | 692 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE LAST WEEK OF NOVEMBER, THE 1A2 ABSORBER PUMP WAS TAKEN OUT OF SERVICE FOR OVERHAUL. THE REPAIRS WERE COMPLETED ON DECEMBER 6, WHEN THE MODULE ASSUMED A ONE ABSORBER PUMP STANDBY CAPABILITY UNTIL THE 1A1 ABSORBER PUMP CAN BE REPAIRED.
DURING THE LAST HALF OF THE MONTH, MODUELE A OPERATED WHILE MODULE B WAS BEING REPAIRED.
MODULE B PERFORMED SATISFACTIORILY DURING THE FIRST HALF OF THE MONTH, EXPERIENCING ONLY ONE NO DEMAND OUTAGE. ON THE 17TH, HOWEVER, THE SPENT SLURRY VALVE FAILED AND THE MODULE HAS REMAINED OUT OF SERVICE.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/77 | A | 98.2 | 98.7 | | 95.8 | | | | | | |
| | B | 13.5 | 1.1 | | 1.1 | | | | | | |
| | SYSTEM | | | | | | | 744 | 722 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1A1 ABSORBER PUMP WENT OUT IN LATE SEPTEMBER WITH BURNED OUT BEARINGS AND REMAINED OUT THROUGH JANUARY WAITING FOR PARTS.
LOW SULFUR COAL WAS BURNED IN THE BOILER FROM NOVEMBER THROUGH JANUARY.
DUE TO THE LOW VOLUME OF SLUDGE PRODUCED WHILE BURNING LOW SULFUR COAL, MUCH OF THE SLUDGE HANDLING TIME WAS SPENT DIGGING OUT THE ACCUMULATED SLUDGE IN THE RECIRCULATION PONDS. THIS MATERIAL, ALONG WITH SCRUBBER WASTE MATERIAL, WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF SITE DISPOSAL AREA.
MODULE A WAS FORCED OUT ONCE BY A FAILED SPENT SLURRY VALVE.
PLUGGED DEMISTER UNDERSPRAYS CAUSED ANOTHER MODULE A OUTAGE.
MODULE A WENT OUT ONCE BECAUSE OF NO DEMAND AND ONCE DUE TO A BOILER OUTAGE (MODULE B WAS ALREADY OUT OF SERVICE FOR REPAIRS).
MODULE B BECAME AVAILABLE FOR SERVICE ON JANUARY 27, AFTER REPAIRS TO THE SPENT SLURRY VALVE WERE COMPLETED. DUE TO SEVERE WEATHER CONDITIONS, THE MODULE WAS PLACED IN THE GAS PATH JANUARY 31.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/77 | A | 38.8 | 42.6 | | 38.8 | | | | | | |
| | B | 72.0 | 45.7 | | 41.7 | | | | | | |
| | SYSTEM | | | | | | | 672 | 613 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WAS VERY LITTLE DIGGING IN THE RECIRCULATION PONDS. CHICAGO FLYASH SPENT MOST OF THEIR TIME ON CLEANING AND MAINTENANCE.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/77 | A | 96.9 | 66.7 | | 64.2 | | | | | | |
| | B | 80.9 | 75.5 | | 73.9 | | | | | | |
| | SYSTEM | | | | | | | 744 | 728 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

AN ERT SO2 ANALYZER WAS INSTALLED ON THE DISCHARGE SIDE OF MODULE B I.D. BOOSTER FAN. THIS IS AN "IN SITU" ON-DISPERSIVE ANALYZER THAT CONTINUALLY MEASURES AND READS OUT CONCENTRATIONS OF SO2, CO, CO2, AND NO.
AN ABSORBER SUCTION HEADER LEAK FORCED MODULE B FROM THE GAS PATH.
MODULE B WAS FORCED OUT DUE TO A SLURRY VALVE GASKET LEAK.

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----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                         A PLUGGED FEED SLURRY RECIRCULATION LINE WAS ENCOUNTERED IN MODULE B.
                         HIGH SULFUR COAL WAS BURNED FOR SEVEN DAYS THIS MONTH TO PROVIDE HIGH
                         SULFUR SLUDGE FOR THE UOP SLUDGE TEST.
                         CHICAGO FLYASH SPENT 75% OF THEIR TIME DIGGING IN THE POND. THE REST WAS
                         SPENT ON THE THICKENER AND VACUUM FILTER IPERATION. THE SCRUBBER WASTE
                         MATERIAL WAS TREATED WITH LIME FLYASH AND HAULED OFF SITE.
                         DISPOSAL AREA.

 4/77  A           86.1        67.7                    61.2
       B           45.5        30.2                    27.3
       SYSTEM                                                                   720   650

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         THE PERFORMANCE OF THE ERT SO2 ANALYZER TO DATE HAS BEEN, AT BEST, UNRELIA-
                         BLE AND INCONSISTENT. THE ERT TECHNICIANS ARE OUT TO SERVICE THE ANALYZER
                         ALMOST EVERY OTHER DAY. THE PROBLEM, ACCORDING TO ERT TECHNICIANS, IS OF A
                         "THERMAL NATURE". WHEN THE ANALYZER REACHES A CERTAIN TEMPERATURE, A CHIP
                         SHORTS OUT. THEY HAVE NOT BEEN ABLE TO LOCATE THE FAULTY INTEGRATED CIRCUIT
                         YET.
                         A BOILER TUBE LEAK REPAIR FORCED MODULE A OUT OF THE GAS PATH ONCE THIS
                         MONTH (MODULE B WAS ALREADY DOWN FOR REPAIRS).
                         MODULE B WAS FORCED OUT OF THE GAS PATH TWICE FOR AN ABSORBER SUCTION
                         HEADER LEAK REPAIR.
                         MODULE B WAS OUT OF SERVICE ONCE TO WASH THE I. D. BOOSTER FAN.
                         CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME DIGGING IN THE SMALL POND,
                         GETTING READY FOR THE MGO ADDITION AND FORCED OXIDATION TEST. THE SCRUBBER
                         WASTE MATERIAL WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF SITE
                         DISPOSAL AREA.

 5/77  A           89.4         2.2                     2.0
       B           98.0        50.9                    47.3
       SYSTEM                                                                   744   691

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         THE ERT SO2 ANALYZER HAS BEEN REMOVED FROM SERVICE DUE TO A POOR PERFORM-
                         ANCE RECORD OVER THE LAST THREE MONTHS. ERT IS IN THE PROCESS OF RE-
                         ENGINEERING THEIR ANALYZER.
                         THE MGO ADDITION TEST WENT WELL. ALTHOUGH THE MGO INCREASED SO2 REMOVAL
                         EFFICIENCY ABOUT 10%, IT DID PRACTICALLY NOTHING FOR THE TWO MORE SERIOUS
                         PROBLEMS, SINCE THICKENER AND SLUDGE PRODUCTION AND LIMESTONE CONSUMPTION
                         RATE WERE ABOUT THE SAME.
                         MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE INLET
                         VALVE ON 1A2 ABSORBER PUMP FAILED.
                         MODULE B WAS TAKEN OFF TO CLEAN AND INSPECT THE REHEATER TUBES.
                         BOTH MODULES WERE FORCED OFF FOR THE FIRST FIFTEEN DAYS OF THE MONTH DUE TO
                         A FAILED 120V CONTROL TRANSFORMER FOR THE POND RETURN PUMPS. THE TRANSFORM-
                         ER HAD TO BE ORDERED FROM WESTINGHOUSE.
                         HIGH SULFUR COAL HAS BURNED FOR ELEVEN DAYS DURING THE MONTH.

 6/77  A           31.8        13.3                    10.5
       B           93.2        93.4                    73.5
       SYSTEM                                                                   720   566

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         THE 1A1 ABSORBER PUMP IS STILL OUT OF SERVICE WAITING FOR PARTS 1A2
                         ABSORBER PUMP'S ISOLATION VALVES FORCED MODULE A OFF FOR MOST OF T(E MONTH.
                         MODULE A HAD ONE NO DEMAND AND ONE BOILER OUTAGE THIS MONTH.
                         MODULE B WAS ALSO FORCED OFF TO CLEAN THE I.D. BOOSTER FAN.
                         NO HIGH SULFUR COAL WAS BURNED THIS MONTH.

 7/77  B           70.3        41.4                    21.0
       SYSTEM                                                                   744   377

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         HIGH SULFUR COAL HAS BURNED FOR EIGHT DAYS THIS MONTH. LIMESTONE OPERATION
                         WAS NORMAL FOR HIGH SULFUR OPERATION.
                         MODULE B WAS FORCED OUT OF THE GAS PATH ONCE TO REMOVE A PLUGGED DIFFUSER.
                         THE FINAL TEST, FORCED OXIDATION SEEMDD TO BE THE MOST SUCCESSFUL OF ALL.
                         USING LIQUID OXYGEN, UP TO 12,000 CFM OF GASEOUS O2 WAS FED INTO EACH
                         VENTURI DOWNCOMER, OXIDATION OF SULFITE TO SULFATE WAS INCREASED FROM
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-----------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                          35 TO 90 %
                          MODULE B WAS ALSO FORCED OFF DUE TO A LOW LEVEL IN THE SLURRY STORAGE TANK.
                          MODULE B WAS ALSO FORCED OFF DUE TO REHEATER TUBE BUNDLE LEAKS.

 8/77  A          99.8        99.6                    80.8
       B           9.7        12.0                     9.7
       SYSTEM                                                                744   694

     ** PROBLEMS/SOLUTIONS/COMMENTS
                          MODULE A WAS AVAILABLE THE ENTIRE MONTH WITH JUST THE VENTURI PUMP OPERAT-
                          ING.

 9/77  A          61.0        77.8                    54.0
       B          52.3        75.4                    52.3
       SYSTEM                                                                720   499

     ** PROBLEMS/SOLUTIONS/COMMENTS
                          MODULE B ENCOUNTERED HIGH VIBERATIONS IN ITS BOOSTER FAN DURING THE FIRST
                          WEEK OF THE MONTH. AFTER THE FAN WAS BALANCED, THE MODULE OPERATED INTIL
                          THE UNIT OUTAGE ON SEPTEMBER 21.

10/77  A            .0                                  .0
       B            .0                                  .0
       SYSTEM                                                                744     0

11/77  A            .0                                  .0
       B           8.8        50.1                     8.8
       SYSTEM                                                                720   126

     ** PROBLEMS/SOLUTIONS/COMMENTS
                          UNIT ONE CAME UP ON NOVEMBER 25 AFTER A SIXTY-THREE DAY OUTAGE.
                          MODULE B IS IN THE GAS PATH FATER EXPERIENCING SOME DIFICULTY IN BALANCING
                          ITS BOOSTER FAN.

12/77  A          42.5        42.5        47.8        42.5
       B          84.1        84.1        94.6        84.1
       SYSTEM                                                                744   661

     ** PROBLEMS/SOLUTIONS/COMMENTS
                          PLUGGAGE WAS ENCOUNTERED IN TH EMODULE B REHEATER. BECAUSE NO SPARE REHRAT
                          COILS WERE AVAILABLE, THE UTILITY TRIED TAKING SOME COILS FROM MODULE A
                          MODULE B APPEARED TO BE MORE ONE SEVERELY PLUGGED THAN ORIGINALLY THOUGHT.
                          MODULE A WAS DOWN HALF THE MONTH BECAUSE OF A MAIN STEAM LEAK WHICH COULD
                          NOT BE ISOLATED.
                          MODULE A OPERATED UNTIL SEPTEMBER 19, WH E A COMBINATION OF MUD AND SCALE
                          BUILD-UP ON THE SUMP FLOOR STRUCTURALLY DAMAGED THE MODULE. REPAIRS PUT
                          THE MODULE OUT OF SERVICE UNTIL MID DECEMBER.

 1/78  A          69.0        89.9                    66.3
       B          22.0        29.8                    22.0
       SYSTEM                                                                744   549

     ** PROBLEMS/SOLUTIONS/COMMENTS
                          ON JANUARY 7, THE MODULE B I.D. BOOSTER FAN DISCHARGE DUCT STARTED VIBRAT-
                          ING WILDLY. THIS FORCED THE BOILER OFF WHILE THE SHOP MADE REPAIRS TO THE
                          DUCTWORK AND BALANCED THE FAN WITH AN I.R.D. MACHINE.
                          WHEN THE UTILITY ATTEMPTED TO PUT MODULE B BACK IN THE GAS PATH, A LEAK IN
                          THE SLURRY LINE FORCED IT BACK OFF.
                          A PLUGGED VENTURI PUMP FORCED MODULE B OFF THE REST OF THE MONTH.
                          DURING THE OUTAGE, THE REHEATER COILS WERE CLEANED WITH A HIGH PRESSURE
                          (5000 LB) SPRAYER.
                          MODULE A WAS FORCED OFF WHEN A STEAM REGULATING VALVE BLEW ITS PACKING.
                          ON THE 23RD, BOTH MODULES WERE TAKEN OFF AND DRAINED TO ALLOW THE SHOP TO
                          INSTALL NEW ISOLATION VALVES IN THE ABSORBER AND VENTURI PUMPS.
                          TOWARD THE END OF THE MONTH, SOME PROBLEMS WERE ENCOUNTERED WITH THE POND
                          RETURN PUMPS FREEZING.

 2/78  A          40.9        56.5                    34.6
       B          69.5        92.9                    56.5
       SYSTEM                                                                672   409
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-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL    PER BOILER   FGD   CAP.
                                                                 SO2 PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS
                        MODULE A RAN INTO DIFFICULT OPERATIONG CONDITIONS THIS MONTH DUE TO RAPID
                        PLUGGING OF THE REHEAT COILS.
                        INSPECTION AND SUBSEQUENT CLEANING OF MODULE A UNCOVERED PLUGGED SPRAY
                        NOZZLES AND DEMISTER TRAYS DUE TO NOZZLE INEFFICIENCY.
                        MODULE B OPERATED VERY WELL AND AN INSPECTION SHOWED THE MODULE TO BE VERY
                        CLEAN.

3/78   A           93.5       100.0        90.6
       B           88.5        84.7        76.0       26.2
       SYSTEM                                                               744   230

       ** PROBLEMS/SOLUTIONS/COMMENTS
                        THIS MONTH, DUE TO COAL CONSERVATION, UNIT 1 WAS ON THE SYSTEM VERY LITTLE.
                        MODULE B HAD DIFFICULTY FOR SEVERAL DAYS BECAUSE OF A CRACKED SHEAVE ON THE
                        VENTURI PUMP.
                        HIGH PRESSURE CLEANING ON BOTH MODULES DURING THE COAL CONSERVATION ALONG
                        WITH REMOVING THE VENTURI THROAT RESTRICTOR BLOCKS PROVED BENEFICIAL IN
                        MAINTAINING BETTER CONTROL OF THE DRAFT CONDITIONS IN THE SCRUBBER.

4/78   A           99.9        99.7                   92.0
       B          100.0        99.9                   92.2
       SYSTEM                                                               720   665

       ** PROBLEMS/SOLUTIONS/COMMENTS
                        THE PRESSURE DIFFERENTIAL ACROSS THE VENTURIS HAS BEEN REDUCED BY APPROXI-
                        MATELY 40% AT 140 MW BY REMOVING THE VENTURI RESTRICTOR BLOCKS. PARTICULATE
                        REMOVAL AND SOLIDS CARRYOVER COULD BE ADVERSELY AFFECTED BY THIS ACTION.
                        SINCE PARTICULATE REMOVAL AT THE VENTURI IS A FUNCTION OF WATER DROPLET
                        SIZE, WHICH IN TURN IS A FUNCTION OF PRESSURE DROP. INCREASED SOLIDS CARRY-
                        OVER COULD POSSIBLY COMPUND REHEATER PLUGGING PROBLEMS. THE UTILITY IS
                        KEEPING A CLOSE WATCH FOR PLUGGING, BUT HAS NOT YET FOUND ANYTHING UNUSUAL.
                        MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH FOR A VENTURI PIPE
                        LEAK.

5/78   A            9.5        99.4                   55.2
       B           89.2       100.0                   56.1
       SYSTEM                                                               744   413

       ** PROBLEMS/SOLUTIONS/COMMENTS
                        DURING THE LAST PART OF THE MONTH BOTH MODULES WERE FORCED OUT OF THE GAS
                        PATH DUE TO REHEATER LEAKS. IT REQUIRED A TWO DAY OUTAGE TO REMOVE THE
                        LEAKING REHEATER BUNDLES. ADDITIONAL REHATERS ARE ON ORDER AND ARE EXPECT-
                        ED TO ARRIVE IN JUNE.

6/78   A           87.1        94.5                   23.7
       B           85.6       100.0                   25.1
       SYSTEM                                                               720   181

       ** PROBLEMS/SOLUTIONS/COMMENTS
                        DURING A SCRUBBER INSPECTION, 25% DIEMISTER AND 75% ABSORBER SPRAY PLUGGAGE
                        WAS DISCOVERED IN MODULE A. MODULE B WAS NOT AS BAD.
                        HIGH VIBRATION WAS ENCOUNTERED IN THE TURBINE BEARINGS DURING BOILER START
                        UP, CAUSING THE BOILER TO SHUT BACK DOWN.
                        THE PUG MILL FOR CHICAGO ADMIXTURES HAS BEEN APPROVED, AND THE NEW SLUDGE
                        TREATMENT SYSTEM SHOULD BE OPERATING BY FALL.
                        THE SCRUBBER WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE 1B1
                        ABSORBER DISCHARGE VALVE FAILED TO OPEN.
                        THE BOILER WAS FORCED OFF THE LAST FOUR DAYS OF THE MONTH FOR CYCLONE
                        LEAKS. DURING THIS OUTAGE, THE A AND B MODULE SPENT SLURRY VALVES
                        WERE REPLACED.

7/78   A           97.0       100.0                   11.6
       B           99.2       100.0                   11.6
       SYSTEM                                                               744    77
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COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS PLAGUED ALL MONTH BY CYCLONE CASING LEAKS. BECAUSE OF THE CYCLONE PROBLEMS AND THE COAL CONSERVATION PROGRAM, THE BOILER WAS ONLY OPERATED SEVENTY-SEVEN HOURS FOR THE MONTH.

THE BOILER DOWN TIME WAS USED FOR PREVENTATIVE MAINTENANCE ON THE SCRUBBER. SIX NEW REHEATERS WERE INSTALLED AND A DRAIN VALVE ON THE SPENT SLURRY LINE WAS REPAIRED.

A VALVE FAILURE ON THE 1A1 ABSORBER PUMP FORCED THE SCRUBBER FROM THE GAS PATH ONCE DURING THE MONTH.

MODULE B EXPERIENCED A LEAKING VENTURI HEADER.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/78 | A | 97.8 | 100.0 | | 59.1 | | | | | | |
| | B | 99.6 | 100.0 | | 59.1 | | | | | | |
| | SYSTEM | | | | | | | 744 | 440 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED OFF TO AN OFF SITE DISPOSAL AREA.

REPAIRS TO THE VENTURI EMERGENCY SPRAY VALVE CAUSED ONE BOILER OUTAGE DURING THE MONTH.

A REHEATER FLANGE LEAK WAS RESPONSIBLE FOR FORCING THE UNIT OFF.

MODULE A WAS FORCED OFF ONCE DUE TO HIGH VIBRATION OF THE I.D. BOOSTER FAN. THE PROBLEM WAS CORRECTED BY REPACKING THE COUPLING ON THE FAN.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/78 | A | 77.7 | 95.9 | | 55.4 | | | | | | |
| | B | 77.7 | 96.0 | | 55.5 | | | | | | |
| | SYSTEM | | | | | | | 720 | 416 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

REHEATER TUBE LEAKS, ONE IN MODULE A AND FOUR IN MODULE B, CAUSED ONE BOILER OUTAGE AND CAUSED THE FGD SYSTEM TO BE UNAVAILABLE FOR A TOTAL OF NINETY HOURS. SAMPLES OF THE TUBES HAVE BEEN SUBMITTED TO O.A.D. FOR METALLURGICAL EXAMINATION.

A RUPTURED AIR LINE ON A VENTURI PUMP ISOLATION VALVE WOULD NOT ALLOW THE E VALVE TO GO COMPLETELY CLOSED.

WHEN THE A VENTURI PUMP WAS STARTED, A VENTURI SPRAY HOSE RUPTURED.

IT WAS DISCOVERED THAT THE MODULE A VENTURI TANK LEVEL PRESSURE SWITCH WAS NOT WORKING PROPERLY.

THE PUGMILL ORDERED FOR CHICAGO ADMIXTURES HAS ARRIVED ON SITE. IN OCTOBER, THEY WILL FINISH THE CONVERSION, WHICH WILL ALLOW THE MATERIAL SERVICE MIXER TRUCKS TO BE ELIMINATED.

IN OCTOBER, THE THICKENER WILL HAVE TO BE BYPASSED WHILE THE UTILITY DOES MAINTENANCE ON THE RAKE AND REPLACES SOME LEAKING VALVES.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/78 | A | 100.0 | 100.0 | | 35.0 | | | | | | |
| | B | 100.0 | 100.0 | | 35.0 | | | | | | |
| | SYSTEM | | | | | | | 744 | 261 | | |

** PROBLEMS/SOLUTIONS/COMMENTS

LOW BOILER HOURS WERE DUE TO FOUR OUTAGES CAUSED BY HIGH BEARING METAL TEMPERATURES AND EXCESSIVE VIBRATION IN THE 1-B FORCED DRAFT FAN.

THE BOILER DOWN TIME WAS UTILIZED FOR CLEANING AND REPAIR OF THE VENTURI THROAT, SUMP AND SUMP SCREENS, AND INLET BLOCK DAMPERS OF MODULE A, AS WELL AS THE VENTURI AND ABSORBER TANKS AND SCREENS AND ALL ABSORBER SPRAY NOZZLES OF BOTH MODULES.

ON INSPECTION, IT WAS DISCOVERED THAT THE B MODULE ABSORBER DEPARTMENTAL DAMPER HAD SLIPPED 50% CLOSED. THE DAMPERS WERE JACKED OPEN AND WELDED IN PLACE.

TO CORRECT A HIGH PRESSURE DROP ACROSS THE MODULE B REHEATER, A NEW METHOD WAS EMPLOYED WHEREBY ONLY THE MIDDLE TUBES WERE REMOVED, ALLOWING THE TOP AND BOTTOM TUBES TO BE SEEN AND CLEANED, ELIMINATING THE REMOVAL OF ALL THE TUBES. THIS PROCEDURE CUT OUTAGE TIME FROM ONE OR TWO WEEKS TO TWO DAYS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/78 | A | 96.2 | 100.0 | | 48.3 | | | | | | |

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-----------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL   PER BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
       B           85.2      100.0                     48.3
       SYSTEM                                                               720   348

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         THE UNIT WAS DOWN THREE TIMES THIS MONTH DUE TO A VENTURI PUMP AND TWO
                         BOOSTER FAN OUTAGES.

12/78  A           65.3      100.0                     64.5
       B           64.5      100.0                     64.5
       SYSTEM                                                               744   480

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         REHEATER TUBE LEAKS CAUSED TWO OUTAGES.
                         THE MODULE B SPENT SLURRY DRAIN WAS REPAIRED.

1/79   A           83.5      100.0                     61.3
       B           62.2       87.1                     53.4
       SYSTEM                                                               744   456

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         THE SO2 PLANT WAS FORCED OFF TWICE THIS MONTH DUE TO REHEATER TUBE LEAKS.
                         TWO TUBES ON MODULE A AND FOUR TUBES ON MODULE B WERE REPLACED.
                         THE I.D. BOOSTER FAN ON MODULE B WAS FOULED AND HAD TO BE REPLACED.
                         TWO SPECIAL SECTIONS OF VENTURI PIPING, A SIXTEEN TO EIGHT INCH ECCENTRIC
                         REDUCER AND AN OFFSET TEE WERE PREPARED BY LOCKPORT FABRICATING AND INSTAL-
                         LED THIS MONTH. THE ORIGINAL REDUCER AND TEE HAD BEEN PATCHED AND WELDED SO
                         MANY TIMES THAT THEY WERE BEYOND REPAIR.

2/79   A           93.0       91.3                     54.2
       B           93.0       91.3                     54.2
       SYSTEM                                                               672   399

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         THE UNIT WAS FORCED OFF ONCE FOR A MAIN STEAM HEADER LEAK.

3/79   A          100.0      100.0                     46.0
       B           68.6      100.0                     46.0
       SYSTEM                                                               744   343

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         THE SYSTEM WAS FORCED OUT TWICE IN FEBRUARY AND FOUR TIMES IN MARCH DUE   E
                         TO A VENTURI HEADER LEAK. A TEN FOOT SECTION OF PIPE WILL HAVE TO BE
                         REPLACED DUE TO EXTENSIVE CORROSION.
                         THE SYSTEM WAS DOWN ONCE FOR A SPRAY HEADER LEAK.
                         MODULE B EXPERIENCED A LEAK IN THE VENTURI DOWNCOMER. A FIVE FOOT SECTION
                         OF THE PIPE WILL HAVE TO BE REPLACED.

4/79   A
       SYSTEM                                                               720

5/79   A                                                 .0
       B                                                 .0
       SYSTEM                                                               744     0

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         UNIT 1 WAS OUT OF SERVICE THE ENTIRE MONTH DUE TO A BOILER OVERHAUL.
                         CHICAGO ADMIXTURES WILL STOCKPILE THE FIXED SLUDGE ON STATION PROPERTY.

6/79   SYSTEM                                                               720     0

7/79   SYSTEM                                                               744     0

8/79   SYSTEM                                                               744     0

       ** PROBLEMS/SOLUTIONS/COMMENTS
                         UNIT 1 WAS OUT OF SERVICE TO REPLACE THE AIR HEATER TUBES, TUBE SHEET AND
                         HOPPERS.  DURING THIS OUTAGE, THE WORN VENTURI SPRAY NOZZLES AND DEMISTERS
                         WERE REPLACED.  WELDING LEAKS AND GENERAL CLEANING OF THE SO2 INTERNALS
                         WAS ALSO DONE AT THIS TIME.
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COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                           THE BOILER AND THE SCRUBBER ARE SCHEDULED TO RETURN TO SERVICE OCTOBER 1,
                           1979.

 9/79  SYSTEM                                                                  720     0

10/79  SYSTEM                                                                  744     0

11/79  A           53.3        100.0                    85.4
       B           53.3        100.0                    85.4
       SYSTEM      53.3        100.0                    85.4                   720   336    336

       ** PROBLEMS/SOLUTIONS/COMMENTS
                           ON NOVEMBER 5, UNIT 1 RETURNED TO SERVICE AFTER A SIX MONTH OUTAGE TO
                           REPLACE THE AIR HEATER TUBES, TUBE SHEET AND HOPPERS.
                           DURING THE OUTAGE, SEVERAL LENGTHS OF VENTURI PIPING HAD TO BE REPLACED
                           WITH NEW RUBBER LINED PIPE.
                           THE UNIT DID NOT FORCE THE BOILER OFF AT ANY TIME DURING NOVEMBER.

12/79  A           77.0         99.5                    57.5
       B           84.9        100.0                    57.8
       SYSTEM      77.0         99.5                    57.5                   744   431    428

       ** PROBLEMS/SOLUTIONS/COMMENTS
                           ON DECEMBER 4, UNIT 1 CAME OFF LINE SO THAT THE AIR HEATER HOPPERS AND
                           PRECIPITATOR HOPPERS COULD BE EMPTIED OF CARBON CARRY-OVER AND DEBRIS.
                           DURING THIS OUTAGE THE SHOP REPAIRED A LEAK IN THE POND RETURN LINE.
                           ON DECEMBER 10, THE A MODULE DEVELOPED A SERIOUS STEAM LEAK (25,000 MAKE-
                           UP) IN A LOWER REHEAT BUNDLE.  THE LEAKING BUNDLE HAD TO BE REMOVED AND
                           REPLACED.  THIS RESULTED IN A TWO DAY FORCED OUTAGE.  LATTER IN THE MONTH
                           THE A MODULE BLEW ANOTHER REHEATER TUBE FORCING THE BOILER OFF FOR AN
                           ADDITIONAL 25 HOURS AND 12 MINUTES.
                           THE A MODULE WAS REMOVED FROM THE GAS PATH ON DECEMBER 29, FOR THREE HOURS
                           TO ALLOW THE MAINTENANCE SHOP TO WELD A LEAKING REHEATER FLANGE.
                           THE SO2 PLANT FORCED THE BOILER OFF TWICE THIS MONTH.  TOTAL FORCED OUTAGE
                           TIME ATTRIBUTED TO THE SCRUBBER WAS 54 HOURS AND 39 MINUTES.

 1/80  A           91.0         87.5                    63.0
       B           88.6         84.1                    60.6
       SYSTEM      88.6         84.1                    60.6                   744   536    451

       ** PROBLEMS/SOLUTIONS/COMMENTS
                           THE FIRST SIX DAYS OF JANUARY, UNIT 1 BOILER WAS OFF THE SYSTEM BECAUSE
                           OF A SLAG SCREEN TUBE LEAK.  THE UNIT RETURNED TO SERVICE ON JANUARY 7.
                           ON JANUARY 16, THE UTILITY HAD TO DERATE UNIT 1 TO 50 MW BECAUSE THE RE-
                           HEATER SECTIONS ON A AND B MODULES WERE PLUGGING.  ON JANUARY 17, THE
                           MODULES WERE TAKEN OUT OF THE GAS PATH TO BEGIN REMOVING AND CLEANING THE
                           REHEATER SECTIONS WITH A HIGH PRESSURE (4000 PSI) WATER SPRAY.  UNIT 1
                           BOILER WAS LEFT ON TO PROVIDE STABILITY FOR THE 138 KV SYSTEM.
                           IN THE PAST, ALL FORTY-TWO BUNDLES CONSISTING OF SEVEN TUBES PER BUNDLE,
                           HAD TO BE TAKEN OUTSIDE TO BE CLEANED ON A CONCRETE SLAB.  IN THIS CASE
                           SINCE TIME WAS THE MOST IMPORTANT FACTOR, A DIFFERENT APPROACH WAS USED.
                           ONLY THE MIDDLE SIX BUNDLES ON EACH MODULE WAS REMOVED.  THIS PROVIDED A
                           LARGE ENOUGH SPACE SO THAT A LANCE WITH AN EXTENSION ON IT COULD BE USED
                           TO CLEAN THE BOTTOM OF THE TWO TOP BUNDLES AND THE TOP OF THE TWO BOTTOM
                           BUNDLES.  THERE ARE DOORS THAT ALLOW EASY ACCESS TO THE TOP AND BOTTOM
                           OF THE REHEATER.  USING THIS METHOD, ONLY TWELVE OF THE FORTY-TWO BUNDLES
                           WERE REMOVED.  IN THE PAST, THIS JOB HAS TAKEN AS LONG AS TWO WEEKS TO
                           COMPLETE.  USING THE NEW METHOD, ALL THE REHEATER BUNDLES WERE CLEANED IN
                           TWENTY HOURS.
                           THE B MODULE WAS FORCED OFF LINE ON TWO OTHER OCCASIONS IN JANUARY.  BOTH
                           THESE OUTAGES WERE CAUSED BY THE REHEATER (A COIL LEAK AND A FLANGE LEAK)
                           TOTALING 18 HOURS AND 24 MINUTES.

 2/80  SYSTEM                                                                  696

 3/80  SYSTEM                                                                  744
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COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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------------------------------------------PERFORMANCE DATA--------------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER   FGD   CAP.
                                                                SO2  PART.  HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- -----  -----  ------ ----- ------

        ** PROBLEMS/SOLUTIONS/COMMENTS
                                      NO INFORMATION FOR THE WILL COUNTY UNIT WAS AVAILABLE FOR FEBRUARY AND
                                      MARCH.
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                   DETROIT EDISON
PLANT NAME                                     ST. CLAIR
UNIT NUMBER                                    6
CITY                                           BELLE RIVER
STATE                                          MICHIGAN
REGULATORY CLASSIFICATION                      C
PARTICULATE EMISSION LIMITATION - NG/J         ******        (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  1376.        ( 3.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              1775.0
GROSS UNIT GENERATING CAPACITY - MW              260.0
NET UNIT GENERATING CAPACITY W/FGD - MW        *******
NET UNIT GENERATING CAPACITY WO/FGD - MW       *******
EQUIVALENT SCRUBBED CAPACITY - MW              *******

** BOILER DATA
   SUPPLIER                                    COMBUSTION ENGINEERING
   TYPE                                        ******
   SERVICE LOAD                                BASE
   COMMERCIAL SERVICE DATE                      0/61
   MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         465.77      ( 987000 ACFM)
   FLUE GAS TEMPERATURE - C                      132.2       ( 270 F)
   STACK HEIGHT - M                            ******        (**** FT)
   STACK TOP DIAMETER - M                      *******       (***** FT)

** FUEL DATA
   FUEL TYPE                                   COAL
   FUEL GRADE                                  SUBBITUMINOUS
   AVERAGE HEAT CONTENT - J/G                  *******       (****** BTU/LB)
   RANGE HEAT CONTENT - BTU/LB                                9,500 - 9,600
   AVERAGE ASH CONTENT - %                         4.00
   RANGE ASH CONTENT - %                       ******
   AVERAGE MOISTURE CONTENT - %                ********
   RANGE MOISTURE CONTENT - %                  22 - 24
   AVERAGE SULFUR CONTENT - %                       .35
   RANGE SULFUR CONTENT - %                    0.3 - 0.4
   AVERAGE CHLORIDE CONTENT - %                ********
   RANGE CHLORIDE CONTENT - %                  ******

** ESP

** MECHANICAL COLLECTOR

** PARTICULATE SCRUBBER
   NUMBER                                      2
   TYPE                                        VENTURI


-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL  PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

11/74  SYSTEM                                                                720

12/74  SYSTEM                                                                744

 1/75  SYSTEM                                                                744

      ** PROBLEMS/SOLUTIONS/COMMENTS
                         INSTALLATION OF THE FGD SYSTEM WAS ESSENTIALLY COMPLETED BY THE NOVEMBER,
                         1974 THROUGH JANUARY 1975 PERIOD.
                         A FAULTY INSTRUMENT PANEL WHICH WAS INCORRECTLY WIRED HAS BEEN RETURNED TO
                         THE MANUFACTURER FOR REPAIR.
                         TO DATE, THE UTILITY HAS WATER TESTED ALL THE AUXILIARY EQUIPMENT.  THE ID
                         FAN HAS BEEN TESTED AND AIR BALANCE HAS BEEN CHECKED.

 2/75  SYSTEM                                                                672

 3/75  SYSTEM                                                                744

 4/75  SYSTEM                                                                720
```

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|

** PROBLEMS/SOLUTIONS/COMMENTS

A COLD FLUE GAS RUN WAS SUCCESSFULLY CONDUCTED MARCH 22 AND 23. DURING THIS PERIOD THE RUBBER-LINED PUMPS WERE REPAIRED AND THE LIMESTONE PREARATION SYSTEM WAS CALIBRATED.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/75 | SYSTEM | | | | | | | 744 | | | |
| 5/75 | SYSTEM | | | | | | | 720 | | | |
| 7/75 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST HOT FLUE GAS RUN WAS CONDUCTED ON JUNE 22, 1975. THE RUN LASTED FOR A PERIOD OF 22 HOURS. DURING THIS RUN, THE SCRUBBER WAS PURPOSELY TRIPPED OFF AT LOADS OF 40 AND 80 PERCENT. THIS WAS PERFORMED TO OBSERVE IF ANY DETRIMENTAL EFFECTS TO THE STEAM GENERATION OPERATIONS RESULTED. NONE WERE DETECTED. THE SYSTEM WAS TAKEN OUT OF SERVICE FOLLOWING THIS GAS RUN TO CORRECT THE FOLLOWING MAJOR OPERATION AREAS:

GAS CIRCUIT: LUGI THROAT POSITIONAL FAILURE; DETERIORATION OF THE DAMPER SEALS; SEVERE VIBRATIONS; SO2 ANALYZERS INOPERATIVE.

LIQUID CIRCUIT: FAILURE OF PH CONTROL SYSTEM; TARGET FLOW METER TARGETS HAVE BEEN BROKEN OFF; PUMP SEAL WATER LOW FLOW ALARM TRIPS.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/75 | SYSTEM | | | | | | | 744 | | | |
| 9/75 | SYSTEM | | | | | | | 720 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

A SECOND HOT FLUE GAS RUN WAS INITIATED ON AUGUST 6 AND LASTED 27 HOURS. THE RUN WAS TERMINATED BECAUSE OF A REHEATER THERMOCOUPLE FAILURE. A SUBSEQUENT INSPECTION OF THE SCRUBBING SYSTEM REVEALED NO APPARENT ABNORMALITIES OR MALFUNCTIONS.

A THIRD HOT FLUE GAS RUN OF 41 HOURS DURATION WAS COMPLETED OCTOBER 9. THE MAIN OBJECTIVE OF THIS RUN WAS TO EVALUATE VARIOUS COMPONENTS OF THE FRESH WATER SPRAY SYSTEM AND EFFECTS ON SYSTEM OPERATION. THE TEST RUN WAS PREMATURELY TERMINATED BECAUSE OF A BOILER FEED PUMP MALFUNCTION, RESULTING IN A REDUCED BOILER LOAD CAUSING SUBSEQUENT WEEPING OF THE WASH TRAY.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/75 | SYSTEM | | | | | | | 744 | | | |
| 11/75 | SYSTEM | | | | | | | 720 | | | |
| 12/75 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

A FOURTH FLUE GAS RUN OF 23 DAYS DURATION WAS TERMINATED DUE TO EXCESSIVE VIBRATION IN THE I.D. & BOOSTER FAN. ONE OTHER SCRUBBER-RELATED OUTAGE OCCURRED WHEN THE PACKING OF ONE OF THE SCRUBBER RECIRCULATION PUMPS NEEDED MAINTENANCE. SO2 REMOVAL DURING THIS PERIOD WAS 90 PERCENT AND PARTICULATE OUTLET LOADING WAS 0.1 LB/1000 LBS OF FLUE GAS FOR 1-3 PERCENT SULFUR COAL.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/76 | SYSTEM | | | | | | | 744 | | | |
| 2/76 | SYSTEM | | | | | | | 696 | | | |
| 3/76 | SYSTEM | | | | | | | 744 | | | |
| 4/76 | SYSTEM | 100.0 | 100.0 | | | | | 720 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE 30-DAY VENDOR QUALIFICATION RUN AND FINAL ACCEPTANCE TEST WERE COMPLETED BY MAY 29. THE QUALIFICATION RUN WAS CONDUCTED ON A "HANDS OFF" BASIS USING PLANT PERSONNEL EXCLUSIVELY. THE SYSTEM WAS IN SERVICE 100 PERCENT OF THE TIME THE BOILER WAS OPERATIONAL. THE FINAL ACCEPTANCE TEST CONSISTED OF SIX 4-HR. TEST RUNS CONDUCTED IN THE SPACE OF ONE WEEK. THE SO2 REMOVAL EFFICIENCY FOR HIGH SULFUR COAL WAS 90.9 PERCENT. PARTICULATE REMOVAL ALSO EXCEEDED DESIGN LEVELS. NO MAJOR CHEMICAL OR MECHANICAL-RELATED PROBLEMS WERE ENCOUNTERED.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/76 | SYSTEM | | | | | | | 744 | | | |

DETROIT EDISON: ST. CLAIR 6 (CONT.)

```
------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 6/76  SYSTEM                                                                720

 7/76  SYSTEM                                                                744

 8/76  SYSTEM                                                                744

    ** PROBLEMS/SOLUTIONS/COMMENTS
                            THE UTILITY IS NOW PREPARING TO CONDUCT A 2 MONTH MINIMUM INTERNAL SCRUBBER
                            DEMONSTRATION PROGRAM TO ACQUIRE OPERATING DATA AND INFORMATION.  FOLLOWING
                            THE COMPLETION OF THIS PROGRAM THE BOILERS WILL FIRE LOW SULFUR DECKER
                            COAL (0.3 TO 4.0 PERCENT) TO MEET SO2 EMISSION REGULATIONS.  THE SCRUBBERS
                            WILL CONTINUE TO OPERATE IN THE PARTICULATE REMOVAL MODE.

 9/76  SYSTEM                                                                720

10/76  SYSTEM                                                                744

    ** PROBLEMS/SOLUTIONS/COMMENTS
                            THE INTERNAL SO2 SCRUBBING DEMONSTRATION PROGRAM COMMENCED ON OCTOBER 14.
                            THE SCRUBBERS OPERATED CONTINUOUSLY FOR 10 DAYS.
                            OPERATION ON THE DEMONSTRATION PROGRAM WAS INTERRUPTED BY A FORCED SCRUBBER
                            OUTAGE RESULTING FROM SCALE AND SOLIDS CARRYOVER FROM THE WASH TRAY AND
                            MIST ELIMINATOR TO THE SCRUBBER I.D. BOOSTER FAN ASSEMBLY, CAUSING VIBRA-
                            TION AND BALANCE PROBLEMS.  IT WAS DECIDED TO SANDBLAST THE FAN TO REMOVE
                            SOLIDS BUILDUP ON THE FAN ASSEMBLY.
                            THE UTILITY PLANS TO MODIFY THE COMPONENT'S WASH SYSTEM FOR GREATER FLOW
                            CAPABILITY AFTER COMPLETION OF THE SO2 SCRUBBING PROGRAM.  DECO ALSO PLANS
                            TO CONTINUE PARTICULATE SCRUBBING FOLLOWING THE TERMINATION OF THE SO2
                            PROGRAM BY UNCOUPLING THE SPRAY TOWERS AND MAINTAINING THE PEABODY-LURGI
                            VENTURI SCRUBBERS IN THE FLUE GAS STREAM.  SOME LIMESTONE MAY HAVE TO BE
                            ADDED TO THE PARTICULATE SCRUBBING SOLUTION IN ORDER TO PREVENT LOW PH
                            SWINGS AND MINIMIZE THE POSSIBILITY OF ACID CORROSION DAMAGE TO THE
                            INTERNAL COMPONENTS.

11/76  SYSTEM      80.0                                                      720

    ** PROBLEMS/SOLUTIONS/COMMENTS
                            FOLLOWING THE COMPLETION OF SAND BLASTING OPERATIONS TO SCRUBBER'S I.D.
                            BOOSTER FAN FOR REMOVAL OF SOLIDS BUILD UP, OPERATIONS RESUMED ON NOVEMBER
                            7 AND CONTINUED THROUGHOUT THE MONTH.  THE SYSTEM'S AVAILABILITY INDEX FOR
                            THE MONTH WAS 80 PERCENT.  THE MAJORITY OF THE OUTAGE TIME WAS CONSUMED
                            PROCURING SAND BLASTING SERVICES.  THE OPERATION ITSELF REQUIRED ONLY 8
                            HOURS.

12/76  SYSTEM      51.0                                                      744

    ** PROBLEMS/SOLUTIONS/COMMENTS
                            THE SO2 DEMONSTRATION PROGRAM CONTINUED THROUGHOUT DECEMBER.  THE SYSTEM'SS
                            AVAILABILITY INDEX FOR THE PERIOD WAS 51 PERCENT.
                            SCRUBBER OUTAGES RESULTED FROM LIMESTONE FEEDER PROBLEMS.
                            SCRUBBER OUTAGES RESULTED FROM DENSE SLURRY TRAVERSE PUMP PROBLEMS.
                            SCRUBBER OUTAGES RESULTED FROM DENSE SLURRY TANK AGITATOR MALFUNCTIONS.
                            PH SAMPLING LINE PLUGGING RESULTED IN SOME OUTAGE TIME.

 1/77  SYSTEM        .0                                                      744

 2/77  SYSTEM        .0                                                      672

    ** PROBLEMS/SOLUTIONS/COMMENTS
                            THE SO2 DEMONSTRATION PROGRAM WAS OFFICIALLY TERMINATED ON DEC. 31, 1976.
                            THE SCRUBBER PLANT WAS SHUT DOWN AT THIS POINT AND FLUE GAS WAS BY-PASSED
                            AROUND THE SYSTEM.

 3/77  SYSTEM        .0                                                      744
```

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER REMAINS IN SERVICE, FIRING LOW SULFUR (0.3%) WESTERN COAL. CURRENT PLANS CALL FOR THE SCRUBBER PLANT TO REMAIN OUT OF SERVICE UNTIL MID-JUNE FOR DESIGN AND OPERATING MODIFICATIONS. RESUMPTION OF SCRUBBER OPERATIONS WILL OCCUR IN THE PRIMARY PARTICULATE-REMOVAL MODE. THE PEABODY-LURGI VENTURI SCRUBBERS AND SPRAY TOWER ABSORBERS WILL REMAIN IN THE GAS STREAM. SOLUTION WILL BE CIRCULATED THROUGH THE VENTURI'S WASH TRAYS, AND MIST ELIMINATORS. NO SOLUTION WILL BE CIRCULATED THROUGH THE SPRAY ZONE OF THE ABSORBER TOWERS. LIMESTONE REAGENT WILL BE ADDED TO THE SCRUBBING SOLUTION IN ORDER TO PREVENT LOW PH SWINGS AND SUBSEQUENT MATERIALS DAMAGE TO THE SCRUBBER'S INTERNALS. SO2 REMOVAL SHOULD RESIDE IN THE 35 TO 50% RANGE IN THIS MODE OF OPERATION BECAUSE OF THE SOLUTION'S ALKALINITY DUE TO THE FLY ASH AND LIMESTONE. ALSO DECO PLANS TO MAINTAIN A HIGHER L/G RATIO IN THE SCRUBBER MODULES. THIS MODE OF OPERATION IS PROJECTED TO CONTINUE FOR A ONE TO THREE YEAR PERIOD FOLLOWING THE MID-JUNE RESTART.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/77 | SYSTEM | .0 | | | | | | 720 | | | |
| 5/77 | SYSTEM | .0 | | | | | | 744 | | | |
| 6/77 | SYSTEM | .0 | | | | | | 720 | | | |
| 7/77 | SYSTEM | .0 | | | | | | 744 | | | |
| 8/77 | SYSTEM | .0 | | | | | | 744 | | | |
| 9/77 | SYSTEM | .0 | | | | | | 720 | | | |
| 10/77 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS PULLED OFF LINE IN DECEMBER 1976 AND DID NOT RESTART UNTIL OCTOBER 1977. WHILE THE UNIT WAS DOWN THE UTILITY INSTALLED BUILDINGS AROUND PUMPS THAT WERE EXPOSED TO SEVERE WEATHER CONDITIONS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/77 | SYSTEM | | | | | | | 720 | | | |
| 12/77 | SYSTEM | | | | | | | 744 | | | |
| 1/78 | SYSTEM | | | | | | | 744 | | | |
| 2/78 | SYSTEM | 96.0 | | | | | | 672 | | | |
| 3/78 | SYSTEM | 85.6 | | | | | | 744 | | | |
| 4/78 | SYSTEM | 90.0 | | | | | | 720 | | | |
| 5/78 | SYSTEM | 74.6 | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT EXPERIENCED SPRAY HEADER PROBLEMS IN THE ABSORBER TOWER. SOME BROKEN NOZZLES WERE DISCOVERED.

THERE WERE SOME I.D. BOOSTER FAN PROBLEMS. THE UTILITY MUST SAND BLAST THE FAN EVERY 4 TO 5 WEEKS WHEN THE MAGNITUDE OF VIBRATION OF THE FAN BECOMES EXCESSIVE FROM SCALE FORMATION; HOWEVER, IN THIS INSTANCE THE PROBLEM WAS A RESULT OF A LOW FAN OIL LEVEL.

THE UTILITY NOW OPERATES 3 RECYCLE TANK AGITATORS. PREVIOUSLY ONLY 2 WERE OPERATED. IT WAS FELT THAT PART OF THE TANK PLUGGING WAS A RESULT OF INSUFFICIENT AGITATION.

THE SLURRY SPRAY SURGE TANK ENCOUNTERED CONTINUAL OVERFLOW PROBLEMS WHEN THE ABSORBER SUMP PUMP WAS OPERATING. THIS WAS BELIEVED TO BE A RESULT OF A BROKEN SECTION IN THE SPRAY NOZZLE LINES. SPRAY WAS BEING DIRECTED UPWARD TO THE BOTTOM OF A TRAY INSTEAD OF DOWN, COUNTERCURRENT TO THE GAS FLOW AS INTENDED.

REHEATER PROBLEMS OCCURRED WITH THE FORMATION OF OIL CLINKERS IN THE BURNER AREA. IT WAS DISCOVERED THAT THE AIR SUPPLY TO THE BURNER WAS INSUFFICIENT.

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--------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                                  SOME SPRAY HEADER PROBLEMS WERE ENCOUNTERED.  THE FRP PIPING WAS RUPTURING.
                                  IT WAS SUSPECTED THAT THE RUPTURES WERE A RESULT OF "WATER HAMMER" I.E.
                                  THE SURGE THAT OCCURRS IN THE PIPE WITH A SUDDEN FLOW RATE CHANGE.
                                  THE SPRAY HEADERS WERE PLUGGING.  WHEN THE HEADERS ARE DRAINED (E.G.
                                  SYSTEMS SHUTDOWN) SOME SLURRY SETTLES IN THE HEADER LINES ETC.  RINSE LINES
                                  ARE NOW BEING INSTALLED TO FLUSH OUT HEADERS DURING FUTURE SHUTDOWNS.

 6/78  SYSTEM      87.9                                                    720

       ** PROBLEMS/SOLUTIONS/COMMENTS
                                  ONE OF THE BLADES CAME LOOSE FROM AN I.D. BOOSTER FAN AND PASSED THROUGH
                                  THE HOUSING.  REPAIRS WERE MADE WITHOUT SERIOUS COMPLICATIONS.

 7/78  SYSTEM      96.0                                                    744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                                  THE INSTALLATION OF RINSE LINES HAS NOT YET BEEN COMPLETED.
                                  PROBLEMS WITH RUPTURED SPRAY HEADER PIPING CONTINUED.  IT HAS BEEN POSSIBLE
                                  TO OPERATE THE SCRUBBER WITH THE RUPTURED LINES WITHOUT SERIOUS
                                  CONSEQUENCES.  IT IS NOT CRUCIAL THAT REPAIRS BE MADE IMMEDIATELY.

 8/78  SYSTEM      90.4                                                    744

 9/78  SYSTEM      69.0                                                    720

10/78  SYSTEM        .0                                                    744

11/78  SYSTEM        .0                                                    720

12/78  SYSTEM        .0                                                    744

 1/79  SYSTEM                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                                  DURING THIS PERIOD RECYCLE TANK AGITATORS WERE BREAKING LOOSE AND SIMILAR
                                  PROBLEMS WERE ENCOUNTERED WITH THE SLURRY STORAGE TANK AGITATORS.  THE
                                  SCRUBBING SYSTEM WAS REMOVED FROM SERVICE FROM SEPTEMBER THROUGH JANUARY.
                                  STEADY BEARINGS WERE INSTALLED AT THE BOTTOM OF THE RECYCLE TANK SOLVING
                                  THE RECYCLE TANK AGITATOR PROBLEM.  THE SLURRY STORAGE TANK SYSTEM ALREADY
                                  HAD STEADY BEARINGS.  THESE WERE REWORKED TO IMPROVE OPERATIONS.

 2/79  SYSTEM                                                              672

 3/79  SYSTEM                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                                  SOME REHEATER PROBLEMS OCCURRED.

 4/79  SYSTEM                                                              720

 5/79  SYSTEM                                                              744

 6/79  SYSTEM                                                              720

 7/79  SYSTEM                                                              744

 8/79  SYSTEM                                                              744

 9/79  SYSTEM                                                              720

10/79  SYSTEM                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                                  THE SYSTEM IS CURRENTLY DOWN BUT IS EXPECTED TO BE BACK ON LINE SOON.  THE
                                  SCRUBBING SYSTEM HAS OPERATED ONLY 1 WEEK SINCE MAY 18, 1979 BECAUSE OF
                                  SUMP PROBLEMS.
                                  THE AGITATOR BEARING SYSTEM WAS POORLY DESIGNED.  THE BEARING SYSTEM HAS
                                  NOW BEEN COMPLETELY REDESIGNED.  THE AGITATORS HAVE NOW OPERATED 2000 HOURS
                                  ON THE NEW BEARINGS.  THE UTILITY WILL PROBABLY DRAIN THE TANK AFTER ABOUT
                                  500 MORE HOURS TO INSPECT AND READJUST THE BEARINGS.  THE NEW BEARING
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DETROIT EDISON: ST. CLAIR 6 (CONT.)

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------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                                SYSTEM IS COMPOSED OF STAINLESS STEEL PARTS.
                                100% OF THE ST. CLAIR FLUE GAS PASSES THROUGH THE ESP.  50% OF THAT FLUE
                                GAS ENTERS THE SCRUBBER.  THE UNIT IS REQUIRED TO MEET A 55% OPACITY,
                                HOWEVER, A VARIANCE HAS BEEN GRANTED ALLOWING A 65% OPACITY UNTIL THE
                                SCRUBBER IS AGAIN OPERATIONAL.  THE UTILITY IS PREPARING TO INSTALL A
                                NEW ESP WHICH WOULD BE OPERATIONAL IN 2 YEARS.  WHEN THE NEW ESP IS IN-
                                STALLED THE SCRUBBING SYSTEM AND OLD ESP WILL BE SCRAPPED.  THE UNIT WILL
                                THEN BE REQUIRED TO MEET A 20% OPACITY.

11/79  SYSTEM      90.0                                                    720

12/79  SYSTEM      90.0                                                    744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                                THE UNIT CAME BACK ON LINE AROUND MID-NOVEMBER.
                                NEW DENVER PUMPS WITH EJECTORS WERE INSTALLED TO ASSIST THE SUMP PUMPS
                                UNTIL THE ESP"S COME ON LINE.
                                THE ABSORBER PUMPS HAVE BEEN A PROBLEM RESULTING IN A CAPACITY TURNDOWN
                                TO 225 MW (FROM 230 MW).
                                ONE OF THE COAL MILLS HAS BEEN DOWN CAUSING LIMITED OPERATIONS.

 1/80  SYSTEM                                                              744

 2/80  SYSTEM                                                              696

 3/80  SYSTEM                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                                THE SCRUBBING SYSTEM OPERATED AT BETTER THAN 80% DURING THE FIRST QUARTER
                                OF 1980.
                                THE SCRUBBER ID FAN FAILED.  THE BOLTS HOLDING PART OF THE SHROUDING
                                IN PLACE SHEERED CAUSING THE PLATE TO FALL ONTO THE SHAFT.
                                BECAUSE OF ADDITIONAL PROBLEMS WITH THE A-S-H SUMP PUMPS, THE DENVER PUMPS
                                INSTALLED TO ASSIST THE A-S-H PUMPS NOW CARRY THE ENTIRE LOAD.  THE A-S-H
                                PUMPS DRIVES HAVE BEEN DISCONNECTED.  THE SLURRY CIRCULATES THROUGH THE
                                THE NON-OPERATING A-S-H PUMPS TO THE DENVER PUMPS.
                                THE CONTINUAL PROBLEMS WITH THE LOUVER BY PASS DAMPERS WAS SOLVED BY DIS-
                                CONNECTING THE EXTREME LOUVER AT EITHER END.  THE DAMPERS OPERATE NOW WITH
                                12 OF THE H LOUVERS. THE UTILITY IS PLEASED WITH RECENT DAMPER OPERATIONS.
                                SOME RECENT SCRUBBER OUTAGES RESULTED FROM THE OCCASIONAL UNAVAILABILITY
                                OF LIMESTONE.
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## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                       MINNESOTA POWER & LIGHT
PLANT NAME                                         CLAY BOSWELL
UNIT NUMBER                                        3
CITY                                               COHASSET
STATE                                              MINNESOTA
REGULATORY CLASSIFICATION                          E
PARTICULATE EMISSION LIMITATION - NG/J              258.          (  .600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                     1720.          ( 4.000 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  350.0
GROSS UNIT GENERATING CAPACITY - MW                 364.0
NET UNIT GENERATING CAPACITY W/FGD - MW             347.1
NET UNIT GENERATING CAPACITY WO/FGD - MW            350.0
EQUIVALENT SCRUBBED CAPACITY - MW                   350.0

** BOILER DATA
    SUPPLIER                                       COMBUSTION ENGINEERING
    TYPE                                           PULVERIZED COAL
    SERVICE LOAD                                   BASE
    COMMERCIAL SERVICE DATE                         5/73
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S           613.47        (1300000 ACFM)
    FLUE GAS TEMPERATURE - C                        123.3         ( 254 F)
    STACK HEIGHT - M                                213.          ( 700 FT)
    STACK TOP DIAMETER - M                            7.9         ( 26.0 FT)

** FUEL DATA
    FUEL TYPE                                      COAL
    FUEL GRADE                                     SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                      19538.        (  8400 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                     7500-9900
    AVERAGE ASH CONTENT - %                            9.00
    RANGE ASH CONTENT - %                          4.81-16.0
    AVERAGE MOISTURE CONTENT - %                      26.00
    RANGE MOISTURE CONTENT - %                     24.0-28.0
    AVERAGE SULFUR CONTENT - %                          .92
    RANGE SULFUR CONTENT - %                       0.5-1.5
    AVERAGE CHLORIDE CONTENT - %                        .01
    RANGE CHLORIDE CONTENT - %                     0.0-0.07

** FABRIC FILTER
    NUMBER                                          0
    TYPE                                           NONE

** ESP
    NUMBER                                          0

** MECHANICAL COLLECTOR
    NUMBER                                          0

** PARTICULATE SCRUBBER
    NUMBER                                          1
    TYPE                                           SPRAY IMPINGEMENT TOWER
    SUPPLIER                                       KREBS ENGINEERS
    NUMBER OF STAGES                                   1
    SHELL MATERIAL                                 316LC SS
    LINING MATERIAL                                NONE
    INTERNAL MATERIAL                              316L SS
    TYPE OF NOZZLES                                SPRAY NOZZLES WITH CERAMIC INSERTS
    BOILER LOAD/SCRUBBER - %                        110.0
    FLUE GAS CAPACITY - CU.M/S                      613.5         (1300000 ACFM)
    FLUE GAS TEMPERATURE - C                        123.3         (  254 F)
    LIQUID RECIRCULATION RATE - LITER/S             714.4         (11340 GPM)
    L/G RATIO - LITER/CU.M                            1.1         ( 8.3 GAL/1000ACF)
    PRESSURE DROP - KPA                           *******         (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                    2.4         (     8.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                   6.9         (  3.00 GR/SCF)
    PARTICULATE OUTLET LOAD - NG/J                   34.          (  .078 LB/MMBTU)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        98.7
    SO2 INLET CONCENTRATION - PPM                   800.000
    SO2 DESIGN REMOVAL EFFICIENCY - %                  .0
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MINNESOTA POWER & LIGHT: CLAY BOSWELL 3 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | | | | | | | 744 | | | |
| 11/79 | SYSTEM | | | | | | | 720 | | | |
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER 1980.

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

| | | |
|---|---|---|
| COMPANY NAME | MINNESOTA POWER & LIGHT | |
| PLANT NAME | SYL LASKIN | |
| UNIT NUMBER | 1 | |
| CITY | AURORA | |
| STATE | MINNESOTA | |
| REGULATORY CLASSIFICATION | E | |
| PARTICULATE EMISSION LIMITATION - NG/J | 258. | ( .600 LB/MMBTU) |
| SO2 EMISSION LIMITATION - NG/J | 1720. | ( 4.000 LB/MMBTU) |
| NET PLANT GENERATING CAPACITY - MW | 116.0 | |
| GROSS UNIT GENERATING CAPACITY - MW | 62.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 57.3 | |
| NET UNIT GENERATING CAPACITY WO/FGD - MW | 58.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 58.0 | |
| ** BOILER DATA | | |
| SUPPLIER | COMBUSTION ENGINEERING | |
| TYPE | PULVERIZED COAL | |
| SERVICE LOAD | INTERMEDIATE | |
| COMMERCIAL SERVICE DATE | 0/53 | |
| MAXIMUM BOILER FLUE GAS FLOW - CU.M/S | 141.57 | ( 300000 ACFM) |
| FLUE GAS TEMPERATURE - C | 171.1 | ( 340 F) |
| STACK HEIGHT - M | 91. | ( 300 FT) |
| STACK TOP DIAMETER - M | 3.2 | ( 10.5 FT) |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | SUBBITUMINOUS | |
| AVERAGE HEAT CONTENT - J/G | 20469. | ( 8800 BTU/LB) |
| RANGE HEAT CONTENT - BTU/LB | | 7509-9923 |
| AVERAGE ASH CONTENT - % | 9.00 | |
| RANGE ASH CONTENT - % | 4.81-16.0 | |
| AVERAGE MOISTURE CONTENT - % | 26.70 | |
| RANGE MOISTURE CONTENT - % | 24.0-28.0 | |
| AVERAGE SULFUR CONTENT - % | 1.00 | |
| RANGE SULFUR CONTENT - % | .5-1.5 | |
| AVERAGE CHLORIDE CONTENT - % | .01 | |
| RANGE CHLORIDE CONTENT - % | 0.00-0.07 | |
| ** FABRIC FILTER | | |
| NUMBER | 0 | |
| TYPE | NONE | |
| ** ESP | | |
| NUMBER | 0 | |
| TYPE | NONE | |
| ** MECHANICAL COLLECTOR | | |
| NUMBER | 0 | |
| TYPE | NONE | |
| ** PARTICULATE SCRUBBER | | |
| NUMBER | 1 | |
| TYPE | SPRAY IMPINGEMENT TOWER | |
| SUPPLIER | KREBS ENGINEERS | |
| NUMBER OF STAGES | 1 | |
| SHELL MATERIAL | 316 ELC SS | |
| LINING MATERIAL | NONE | |
| INTERNAL MATERIAL | 316 ELC SS | |
| TYPE OF NOZZLES | SPRAY NOZZLES WITH CERAMIC INSERTS | |
| BOILER LOAD/SCRUBBER - % | 100.0 | |
| FLUE GAS CAPACITY - CU.M/S | 137.4 | ( 291160 ACFM) |
| FLUE GAS TEMPERATURE - C | 171.1 | ( 340 F) |
| LIQUID RECIRCULATION RATE - LITER/S | 151.2 | ( 2400 GPM) |
| L/G RATIO - LITER/CU.M | 1.1 | ( 8.3 GAL/1000ACF) |
| PRESSURE DROP - KPA | ******* | (***** IN-H2O) |
| SUPERFICIAL GAS VELOCITY - M/S | 2.1 | ( 7.0 FT/S) |
| PARTICULATE INLET LOAD - G/CU.M | 4.7 | ( 2.06 GR/SCF) |
| PARTICULATE OUTLET LOAD - NG/J | 34. | ( .078 LB/MMBTU) |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 97.8 | |
| SO2 INLET CONCENTRATION - PPM | 800.000 | |
| SO2 OUTLET CONCENTRATION - PPM | 500.000 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | .0 | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | | | | | | | 744 | | | |
| 11/79 | SYSTEM | | | | | | | 720 | | | |
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER 1980.

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                         MINNESOTA POWER & LIGHT
PLANT NAME                                           SYL LASKIN
UNIT NUMBER                                          2
CITY                                                 AURORA
STATE                                                MINNESOTA
REGULATORY CLASSIFICATION                            E
PARTICULATE EMISSION LIMITATION - NG/J                 258.          (  .600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                        1720.          ( 4.000 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                     116.0
GROSS UNIT GENERATING CAPACITY - MW                     62.0
NET UNIT GENERATING CAPACITY W/FGD - MW                 57.3
NET UNIT GENERATING CAPACITY WO/FGD - MW                59.0
EQUIVALENT SCRUBBED CAPACITY - MW                       58.0

** BOILER DATA
     SUPPLIER                                        COMBUSTION ENGINEERING
     TYPE                                            PULVERIZED COAL
     SERVICE LOAD                                    INTERMEDIATE
     COMMERCIAL SERVICE DATE                          0/53
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S              141.57       ( 300000 ACFM)
     FLUE GAS TEMPERATURE - C                           171.1        ( 340 F)
     STACK HEIGHT - M                                    91.         ( 300 FT)
     STACK TOP DIAMETER - M                               3.2        ( 10.5 FT)

** FUEL DATA
     FUEL TYPE                                       COAL
     FUEL GRADE                                      SUBBITUMINOUS
     AVERAGE HEAT CONTENT - J/G                       20469.         (  8800 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                      7509-9923
     AVERAGE ASH CONTENT - %                              9.00
     RANGE ASH CONTENT - %                           4.81-16.0
     AVERAGE MOISTURE CONTENT - %                        26.70
     RANGE MOISTURE CONTENT - %                      24.0-28.0
     AVERAGE SULFUR CONTENT - %                           1.00
     RANGE SULFUR CONTENT - %                        .5-1.5
     AVERAGE CHLORIDE CONTENT - %                          .01
     RANGE CHLORIDE CONTENT - %                      0.00-0.07

** FABRIC FILTER
     NUMBER                                           0
     TYPE                                            NONE

** ESP
     NUMBER                                           0
     TYPE                                            NONE

** MECHANICAL COLLECTOR
     NUMBER                                           0
     TYPE                                            NONE

** PARTICULATE SCRUBBER
     NUMBER                                           1
     TYPE                                            SPRAY IMPINGEMENT TOWER
     SUPPLIER                                        KREBS ENGINEERS
     NUMBER OF STAGES                                    1
     SHELL MATERIAL                                  316 ELC SS
     LINING MATERIAL                                 NONE
     INTERNAL MATERIAL                               316 ELC SS
     TYPE OF NOZZLES                                 SPRAY NOZZLES WITH CERAMIC INSERTS
     BOILER LOAD/SCRUBBER - %                          100.0
     FLUE GAS CAPACITY - CU.M/S                        137.4         ( 291160 ACFM)
     FLUE GAS TEMPERATURE - C                          171.1         (  340 F)
     LIQUID RECIRCULATION RATE - LITER/S               151.2         ( 2400 GPM)
     L/G RATIO - LITER/CU.M                              1.1         ( 8.3 GAL/1000ACF)
     PRESSURE DROP - KPA                             ********        (***** IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S                      2.1         (    7.0 FT/S)
     PARTICULATE INLET LOAD - G/CU.M                     4.7         (  2.06 GR/SCF)
     PARTICULATE OUTLET LOAD - NG/J                     34.          (  .078 LB/MMBTU)
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %          97.8
     SO2 INLET CONCENTRATION - PPM                     800.000
     SO2 OUTLET CONCENTRATION - PPM                    500.000
     SO2 DESIGN REMOVAL EFFICIENCY - %                    .0
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MINNESOTA POWER & LIGHT: SYL LASKIN 2 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL |  | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |
| 10/79 | SYSTEM |  |  |  |  |  |  | 744 |  |  |  |
| 11/79 | SYSTEM |  |  |  |  |  |  | 720 |  |  |  |
| 12/79 | SYSTEM |  |  |  |  |  |  | 744 |  |  |  |

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL |  | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |
| 1/80 | SYSTEM |  |  |  |  |  |  | 744 |  |  |  |
| 2/80 | SYSTEM |  |  |  |  |  |  | 696 |  |  |  |
| 3/80 | SYSTEM |  |  |  |  |  |  | 744 |  |  |  |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER 1980.

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                  MONTANA-DAKOTA UTILITIES CO.
PLANT NAME                                    LEWIS & CLARK
UNIT NUMBER                                   1
CITY                                          SIDNEY
STATE                                         MONTANA
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J          86.           (  .200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                 430.           ( 1.000 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              50.3
GROSS UNIT GENERATING CAPACITY - MW             55.1
NET UNIT GENERATING CAPACITY W/FGD - MW         50.3
NET UNIT GENERATING CAPACITY WO/FGD - MW        51.5
EQUIVALENT SCRUBBED CAPACITY - MW             *******

** BOILER DATA
    SUPPLIER                                  COMBUSTION ENGINEERING
    TYPE                                      PULVERIZED COAL
    SERVICE LOAD                              BASE
    COMMERCIAL SERVICE DATE                   10/58
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       153.37        ( 325000 ACFM)
    FLUE GAS TEMPERATURE - C                    215.6         ( 420 F)
    STACK HEIGHT - M                             76.          ( 250 FT)
    STACK TOP DIAMETER - M                        4.4         ( 14.5 FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                LIGNITE
    AVERAGE HEAT CONTENT - J/G                 15003.         (  6450 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                6200-6700
    AVERAGE ASH CONTENT - %                        7.80
    RANGE ASH CONTENT - %                     7.2-9.3
    AVERAGE MOISTURE CONTENT - %                  36.20
    RANGE MOISTURE CONTENT - %                34.25-38.16
    AVERAGE SULFUR CONTENT - %                      .61
    RANGE SULFUR CONTENT - %                  .32-1.43
    AVERAGE CHLORIDE CONTENT - %                    .03
    RANGE CHLORIDE CONTENT - %                ******

** MECHANICAL COLLECTOR
    NUMBER                                      1
    TYPE                                      MULTICLONE
    SUPPLIER                                  WESTERN PRECIPITATION
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %    85.7
    FLUE GAS CAPACITY - CU.M/S                  106.2         ( 225000 ACFM)
    FLUE GAS TEMPERATURE - C                    176.7         (  350 F)
    PRESSURE DROP - KPA                       *******         (***** IN-H2O)
    PARTICULATE OUTLET LOAD - G/CU.M              2.93        (  1.28 GR/SCF)

** PARTICULATE SCRUBBER
    TYPE                                      VENTURI
    SUPPLIER                                  RESEARCH COTTRELL
    NUMBER OF STAGES                              1
    SHELL MATERIAL                            CARBON STEEL
    LINING MATERIAL                           CEILCOTE FLAKELINE 103
    INTERNAL MATERIAL                         CARBON STEEL WITH 1" NORTON CA-308
    NUMBER OF NOZZLES                             0
    BOILER LOAD/SCRUBBER - %                    100.0
    FLUE GAS CAPACITY - CU.M/S                  148.0         ( 313730 ACFM)
    FLUE GAS TEMPERATURE - C                    215.6         (  420 F)
    LIQUID RECIRCULATION RATE - LITER/S         212.6         ( 3374 GPM)
    L/G RATIO - LITER/CU.M                        1.7         (13.0 GAL/1000ACF)
    PRESSURE DROP - KPA                       *******         (***** IN-H2O)
    PARTICULATE INLET LOAD - G/CU.M             327.2         (143.00 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M               .1         (  .030 GR/SCF)
    SO2 INLET CONCENTRATION - NG/J            88134.          (****** LB/MMBTU)
```

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MONTANA-DAKOTA UTILITIES CO.: LEWIS & CLARK 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | | | | | | | 720 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A SCHEDULED BOILER OUTAGE GENERAL SCRUBBER MAINTENANCE WAS PERFORMED.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/79 | SYSTEM | | | | | | | 720 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE SCRUBBER WAS TEMPORARILY BYPASSED TO ALLOW FOR REPAIRS NECESSITATED BY A LEAK IN THE FLOODED DISC SCRUBBER.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER PROBLEMS OCCURRED DURING DECEMBER.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE JANUARY THROUGH MARCH PERIOD THE SCRUBBER WAS AVAILABLE MORE THAN 95% OF THE TIME.

THE EROSION PROBLEM MENTIONED DURING NOVEMBER CONTINUED. SECTIONS OF THE LINED CARBON STEEL COLUMN WALL SUPPORTING THE FLOODED DISC WERE RUPTURING, FILLING THE INNER CHAMBER WITH SLURRY AND ULTIMATELY RENDERING THE DISC MOVEMENT MECHANISM INOPERATIVE. THE UTILITY HAS MANAGED TO KEEP THE SCRUBBER OPERATING AS A STOP-GAP MEASURE BETWEEN UNIT SHUTDOWNS BY INSERTING A GARDEN HOSE IN THE COLUMN HOLES AND CONTINUALLY FLUSHING THE INNER CHAMBER. THE UTILITY HAS HAD SOME SUCCESS IN OTHER EROSION AREAS BY MAKING REPAIRS WITH A HASTELLOY MATERIAL. PLANS ARE BEING MADE TO JACKET THE ENTIRE DISC SUPPORT COLUMN WITH HASTELLOY G.

## SECTION 14

## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                      PACIFIC POWER & LIGHT
PLANT NAME                                        DAVE JOHNSTON
UNIT NUMBER                                       4
CITY                                              GLENROCK
STATE                                             WYOMING
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J              90.         (  .210 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                     215.         (  .500 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                *******
GROSS UNIT GENERATING CAPACITY - MW                330.0
NET UNIT GENERATING CAPACITY W/FGD - MW            326.5
NET UNIT GENERATING CAPACITY WO/FGD - MW           330.0
EQUIVALENT SCRUBBED CAPACITY - MW                   33.0

** BOILER DATA
    SUPPLIER                                      COMBUSTION ENGINEERING
    TYPE                                          PULVERIZED COAL
    SERVICE LOAD                                  ******
    COMMERCIAL SERVICE DATE                       **/**
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S           707.85      (1500000 ACFM)
    FLUE GAS TEMPERATURE - C                        132.2       ( 270 F)
    STACK HEIGHT - M                                 76.        ( 250 FT)
    STACK TOP DIAMETER - M                        *******       (***** FT)

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                     17282.       (  7430 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                  5,000-9,000
    AVERAGE ASH CONTENT - %                           12.00
    RANGE ASH CONTENT - %                         ******
    AVERAGE MOISTURE CONTENT - %                      26.00
    RANGE MOISTURE CONTENT - %                    ******
    AVERAGE SULFUR CONTENT - %                          .50
    RANGE SULFUR CONTENT - %                      ******
    AVERAGE CHLORIDE CONTENT - %                        .04
    RANGE CHLORIDE CONTENT - %                    ******

** PARTICULATE SCRUBBER
    NUMBER                                         3
    TYPE                                          VENTURI
    SUPPLIER                                      CHEMICO
    SHELL MATERIAL                                CARBON STEEL, 3/8" AT VENTURI THROAT
    LINING MATERIAL                               POLYESTER-LINED STEEL
    BOILER LOAD/SCRUBBER - %                        33.3
    FLUE GAS CAPACITY - CU.M/S                     327.5        ( 694000 ACFM)
    FLUE GAS TEMPERATURE - C                       135.0        (  275 F)
    LIQUID RECIRCULATION RATE - LITER/S            409.5        ( 6500 GPM)
    L/G RATIO - LITER/CU.M                           1.7        (13.0 GAL/1000ACF)
    PRESSURE DROP - KPA                           *******       (***** IN-H2O)
    PARTICULATE INLET LOAD - G/CU.M                  9.2        (  4.00 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M                  .1        (  .040 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.7
    SO2 INLET CONCENTRATION - PPM                 500.000
    SO2 DESIGN REMOVAL EFFICIENCY - %              40.0


---------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ---- ----- ----- ------ ----- ------

10/79  SYSTEM                                                                744

11/79  SYSTEM                                                                720

12/79  SYSTEM                                                                744
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PACIFIC POWER & LIGHT: DAVE JOHNSTON 4 (CONT.)

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-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS
                             NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

 1/80  SYSTEM                                                                744

 2/80  SYSTEM                                                                696

 3/80  SYSTEM                                                                744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                             NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.
```

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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------------------------------------------------------------------------------------------------------------------

COMPANY NAME                                      POTOMAC ELECTRIC POWER
PLANT NAME                                        DICKERSON
UNIT NUMBER                                       1
CITY                                              DICKERSON
STATE                                             MARYLAND
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J            ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                 1348.0
GROSS UNIT GENERATING CAPACITY - MW                 196.0
NET UNIT GENERATING CAPACITY W/FGD - MW             183.0
NET UNIT GENERATING CAPACITY WO/FGD - MW          *******
EQUIVALENT SCRUBBED CAPACITY - MW                 *******

** BOILER DATA
    SUPPLIER                                      ******
    TYPE                                          PULVERIZED COAL
    SERVICE LOAD                                  ******
    COMMERCIAL SERVICE DATE                       **/**
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         ********        (******* ACFM)
    FLUE GAS TEMPERATURE - C                      *******         (**** F)
    STACK HEIGHT - M                              ******          (**** FT)
    STACK TOP DIAMETER - M                        *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    ******
    AVERAGE HEAT CONTENT - J/G                     27214.         ( 11700 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                     ******
    AVERAGE ASH CONTENT - %                           14.00
    RANGE ASH CONTENT - %                         ******
    AVERAGE MOISTURE CONTENT - %                  ********
    RANGE MOISTURE CONTENT - %                    ******
    AVERAGE SULFUR CONTENT - %                         2.00
    RANGE SULFUR CONTENT - %                      ******
    AVERAGE CHLORIDE CONTENT - %                  ********
    RANGE CHLORIDE CONTENT - %                    ******

** PARTICULATE SCRUBBER
    TYPE                                          VENTURI
    NUMBER OF STAGES                                  2


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

10/79  SYSTEM                 100.0                    83.6                    744    622    622

11/79  SYSTEM                  96.0                    80.1                    720    601    577

12/79  SYSTEM                 100.0                    87.4                    744    650    650

       ** PROBLEMS/SOLUTIONS/COMMENTS
                          DURING THIS PERIOD ONLY ONE SCRUBBER RELATED OUTAGE OCCURRED.  THE OUTAGE
                          WAS FOR AN ID FAN INSPECTION WHICH LASTED ONE DAY.

 1/80  SYSTEM     100.0       100.0                   100.0                    744    744    744

 2/80  SYSTEM      94.3        95.8                    94.3                    696    685    656

 3/80  SYSTEM     100.0       100.0                   100.0                    744    744    744

       ** PROBLEMS/SOLUTIONS/COMMENTS
                          DURING THE FIRST QUARTER 1980 ONLY ONE SCRUBBER OUTAGE OCCURRED.  IN
                          FEBRUARY OUTAGE TIME WAS NECESSARY TO REPAIR A SLURRY RECYCLE LINE LEAK.
```

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                                          SECTION 14
                       DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS
-------------------------------------------------------------------------------------------

 COMPANY NAME                                  POTOMAC ELECTRIC POWER
 PLANT NAME                                    DICKERSON
 UNIT NUMBER                                   2
 CITY                                          DICKERSON
 STATE                                         MARYLAND
 REGULATORY CLASSIFICATION                     ******
 PARTICULATE EMISSION LIMITATION - NG/J        ******          (****** LB/MMBTU)
 SO2 EMISSION LIMITATION - NG/J                ******          (****** LB/MMBTU)
 NET PLANT GENERATING CAPACITY - MW             1348.0
 GROSS UNIT GENERATING CAPACITY - MW             190.0
 NET UNIT GENERATING CAPACITY W/FGD - MW         183.0
 NET UNIT GENERATING CAPACITY WO/FGD - MW      *******
 EQUIVALENT SCRUBBED CAPACITY - MW             *******

 ** BOILER DATA
    SUPPLIER                                   ******
    TYPE                                       PULVERIZED COAL
    SERVICE LOAD                               ******
    COMMERCIAL SERVICE DATE                    **/**
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S      ********        (******* ACFM)
    FLUE GAS TEMPERATURE - C                   *******         (**** F)
    STACK HEIGHT - M                           ******          (**** FT)
    STACK TOP DIAMETER - M                     *******         (***** FT)

 ** FUEL DATA
    FUEL TYPE                                  COAL
    FUEL GRADE                                 ******
    AVERAGE HEAT CONTENT - J/G                  27214.         ( 11700 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                 ******
    AVERAGE ASH CONTENT - %                       14.00
    RANGE ASH CONTENT - %                      ******
    AVERAGE MOISTURE CONTENT - %               ********
    RANGE MOISTURE CONTENT - %                 ******
    AVERAGE SULFUR CONTENT - %                     2.00
    RANGE SULFUR CONTENT - %                   ******
    AVERAGE CHLORIDE CONTENT - %               ********
    RANGE CHLORIDE CONTENT - %                 ******

 ** PARTICULATE SCRUBBER
    TYPE                                       VENTURI
    NUMBER OF STAGES                               2


---------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

10/79  SYSTEM                 100.0                    97.0                 744    722    722

11/79  SYSTEM                  96.4                    88.9                 720    664    640

12/79  SYSTEM                 100.0                   100.0                 744    744    744

        ** PROBLEMS/SOLUTIONS/COMMENTS
                              A ONE DAY OUTAGE OCCURRED, DUE TO A FAN LINING PROBLEM.  NO OTHER
                              UNIT PROBLEMS WERE ENCOUNTERED DURING THE PERIOD.

 1/80  SYSTEM       95.4      96.4                     95.4                 744    736    710

        ** PROBLEMS/SOLUTIONS/COMMENTS
                              IN JANUARY THE SCRUBBER WAS DOWN FOR 3 HOURS TO REPAIR A SLURRY RECYCLE
                              LINE LEAK.
                              31 HOURS OF THE OUTAGE TIME IN JANUARY WAS NECESSARY TO REPAIR A RECYCLE
                              PUMP.

 2/80  SYSTEM      100.0     100.0                    100.0                 696    696    696

 3/80  SYSTEM       96.9      96.9                     96.9                 744    744    721
```

POTOMAC ELECTRIC POWER: DICKERSON 2 (CONT.)

```
------------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS
                        IN MARCH THE SCRUBBER WAS DOWN FOR A SCRUBBER LINING WARRANTY INSPECTION.
                        NO REPAIR WORK WAS NECESSARY.
```

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

| | | |
|---|---|---|
| COMPANY NAME | POTOMAC ELECTRIC POWER | |
| PLANT NAME | DICKERSON | |
| UNIT NUMBER | 3 | |
| CITY | DICKERSON | |
| STATE | MARYLAND | |
| REGULATORY CLASSIFICATION | ****** | |
| PARTICULATE EMISSION LIMITATION - NG/J | ****** | (****** LB/MMBTU) |
| SO2 EMISSION LIMITATION - NG/J | 688. | ( 1.600 LB/MMBTU) |
| NET PLANT GENERATING CAPACITY - MW | 548.0 | |
| GROSS UNIT GENERATING CAPACITY - MW | 190.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 183.0 | |
| NET UNIT GENERATING CAPACITY WO/FGD - MW | ******* | |
| EQUIVALENT SCRUBBED CAPACITY - MW | ******* | |
| ** BOILER DATA | | |
| SUPPLIER | COMBUSTION ENGINEERING | |
| TYPE | PULVERIZED COAL | |
| SERVICE LOAD | BASE | |
| COMMERCIAL SERVICE DATE | 0/62 | |
| MAXIMUM BOILER FLUE GAS FLOW - CU.M/S | 278.42 | ( 590000 ACFM) |
| FLUE GAS TEMPERATURE - C | 126.1 | ( 259 F) |
| STACK HEIGHT - M | 122. | ( 400 FT) |
| STACK TOP DIAMETER - M | ******* | (***** FT) |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 27214. | ( 11700 BTU/LB) |
| RANGE HEAT CONTENT - BTU/LB | | ****** |
| AVERAGE ASH CONTENT - % | 14.00 | |
| RANGE ASH CONTENT - % | ****** | |
| AVERAGE MOISTURE CONTENT - % | ******** | |
| RANGE MOISTURE CONTENT - % | ****** | |
| AVERAGE SULFUR CONTENT - % | 2.00 | |
| RANGE SULFUR CONTENT - % | ****** | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| RANGE CHLORIDE CONTENT - % | ****** | |
| ** ESP | | |
| NUMBER | 1 | |
| SUPPLIER | RESEARCH COTTRELL | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 94.0 | |
| ** PARTICULATE SCRUBBER | | |
| NUMBER | 1 | |
| TYPE | VENTURI | |
| SUPPLIER | CHEMICO | |
| BOILER LOAD/SCRUBBER - % | 50.0 | |
| FLUE GAS CAPACITY - CU.M/S | 139.2 | ( 295000 ACFM) |
| FLUE GAS TEMPERATURE - C | 126.1 | ( 259 F) |
| L/G RATIO - LITER/CU.M | 2.7 | (20.0 GAL/1000ACF) |
| PRESSURE DROP - KPA | ******* | (***** IN-H2O) |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/73 | SYSTEM | | | | | | | 720 | | | |
| 10/73 | SYSTEM | | | | | | | 744 | | | |
| 11/73 | SYSTEM | | | | | | | 720 | | | |
| 12/73 | SYSTEM | | | | | | | 744 | | | |
| 1/74 | SYSTEM | | | | | | | 744 | | | |

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS DURING THIS PERIOD RANGED FROM CORROSION LEAKS IN EXPANSION JOINTS TO PROBLEMS IN MATERIAL HANDLING EQUIPMENT, FEEDING AND SLAKING OF MGO, PLUGGING IN THE MGO MIX TANK AND SUCTION LINES TO THE MGO MAKE-UP PUMPS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/74 | SYSTEM | | | | | | | 672 | | | |
| 3/74 | SYSTEM | | | | | | | 744 | | | |
| 4/74 | SYSTEM | | | | | | | 720 | | | |
| 4/74 | SYSTEM | | | | | | | 720 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

MAINTENANCE AND MODIFICATIONS WERE PERFORMED ON THE SYSTEM. THE MAJOR SYSTEM REVISION MADE DURING THIS PERIOD WAS THE ADDITION OF A PRE-MIX TANK IN THE MGO SYSTEM.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/74 | SYSTEM | | | | | | | 744 | | | |
| 6/74 | SYSTEM | | | | | | | 720 | | | |
| 7/74 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

LIMITED OPERATION OCCURRED BECAUSE THE UTILITY DID NOT HAVE ACCESS TO THE EPA CALCINING FACILITY AT THE ESSEX CHEMICAL COMPANY SULFURIC ACID PLANT. BY THE END OF JUNE 1974, ALL THE MGO AT DICKERSON HAD BEEN USED AND A SILO PLUS THREE CARS WERE FULL OF MGSO3.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/74 | SYSTEM | | | | | | | 744 | | 87 | |
| 9/74 | SYSTEM | | | | | | | 720 | | | |
| 10/74 | SYSTEM | | | | | | | 744 | | | |
| 11/74 | SYSTEM | | | | | | | 720 | | | |
| 12/74 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THIS PERIOD THE SYSTEM GENERALLY OPERATED AT 75 PERCENT OF THE DESIGN GAS FLOW.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/75 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS DEVELOPED IN THE BUCKET ELEVATOR TRANSPORTING THE MGSO3 FROM THE DRYER TO THE STORAGE SILO.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/75 | SYSTEM | | | | | | | 672 | | | |
| 3/75 | SYSTEM | | | | | | | 744 | | | |
| 5/75 | SYSTEM | | | | | | | 744 | | | |
| 6/75 | SYSTEM | | | | | | | 720 | | | |
| 7/75 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT NO. 3 WAS TAKEN OUT OF SERVICE FOR AN 8 TO 12 WEEK TURBINE OVERHAUL. THE SCRUBBER WAS INSPECTED, MAINTENANCE AND MODIFICATIONS WERE MADE.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/75 | SYSTEM | | | | | | | 744 | | | |

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CONSISTS OF A SINGLE, TWO-STAGE SCRUBBER/ABSORBER, WHICH INCORPORATES AN ADJUSTABLE-THROAT VENTURI SCRUBBER FOR PARTICULATE REMOVAL AND A SECOND STAGE ABSORBER WITH A FIXED VENTURI TO REMOVE SO2. THE LIQUOR STREAMS FOR BOTH STAGES ARE SEPARATE AND OPERATE IN A CLOSED-LOOP MODE. UNTIL MID-1975 THE MAGNESIUM SULFITE GENERATED WAS TRANSFERRED TO AN EPA FINANCED FACILITY AT THE ESSEX CHEMICAL COMPANY SULFURIC ACID MANUFACTURING PLANT IN RUMFORD, RHODE ISLAND WHERE MAGNESIUM OXIDE WAS REGENERATED AND SO2 FROM THE REGENERATION PROCESS WAS CONVERTED TO SULFURIC ACID. THE RUMFORD FACILITY HAS SINCE BEEN CLOSED DOWN.

CONSTRUCTION WAS COMPLETED IN AUGUST AND THE SYSTEM STARTED UP IN SEPTEMBER 1973. DURING INTERMITTENT OPERATIONS FOR SHAKEDOWN THROUGH JANUARY 1974, THE SYSTEM'S LONGEST CONTINUOUS RUN WAS 271 HOURS. THE SYSTEM HAS RE-STARTED FROM JULY THROUGH DECEMBER 1974, AND AGAIN ON AUGUST 11, 1975, FOR APPROXIMATELY 87 HOURS.

FGD UNIT OUTAGES WERE CAUSED PRIMARILY BY PIPE AND PUMP CORROSION AND MAJOR TURBINE OVERHAUL OF THE BOILER. PARTICULATE AND SO2 REMOVAL EFFICIENCY GUARANTEES WERE CORROBORATED DURING OPERATIONAL PHASES.

THE FGD SYSTEM WAS RESTARTED IN AUGUST. STEAM WAS LOST TO THE MGO MIX TANK, RESULTING IN A VERY MOIST PRODUCT FROM THE CENTRIFUGE. CAKING IN THE DRYER OCCURRED. AT THIS POINT, THE UTILITY DECIDED TO TEST ONLY THE FIRST-STAGE OF THE SCRUBBING SYSTEM, TAKING GAS AHEAD OF THE PRECIPITATOR. FGD OPERATION AT DICKERSON TERMINATED AT THIS POINT.

THE REMAINING SUPPLY OF MAGNESIUM OXIDE, ABOUT 100 TONS (10 DAYS), HAS BEEN DEPLETED, AND THE DICKERSON UNIT HAS BEEN TERMINATED AS A FGD SYSTEM.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/75 | SYSTEM | | | | | | | 720 | | | |
| 10/75 | SYSTEM | | | | | | | 744 | | | |
| 11/75 | SYSTEM | | | | | | | 720 | | | |
| 12/75 | SYSTEM | | | | | | | 744 | | | |
| 1/76 | SYSTEM | | | | | | | 744 | | | |
| 2/76 | SYSTEM | | | | | | | 696 | | | |
| 3/76 | SYSTEM | | | | | | | 744 | | | |
| 4/76 | SYSTEM | | | | | | | 720 | | | |
| 5/76 | SYSTEM | | | | | | | 744 | | | |
| 6/76 | SYSTEM | | | | | | | 720 | | | |
| 7/76 | SYSTEM | | | | | | | 744 | | | |
| 8/76 | SYSTEM | | | | | | | 744 | | | |
| 9/76 | SYSTEM | | | | | | | 720 | | | |
| 11/76 | SYSTEM | | | | | | | 720 | | | |
| 12/76 | SYSTEM | | | | | | | 744 | | | |
| 1/77 | SYSTEM | | | | | | | 744 | | | |
| 2/77 | SYSTEM | | | | | | | 672 | | | |
| 3/77 | SYSTEM | | | | | | | 744 | | | |
| 4/77 | SYSTEM | | | | | | | 720 | | | |
| 5/77 | SYSTEM | | | | | | | 744 | | | |
| 6/77 | SYSTEM | | | | | | | 720 | | | |
| 7/77 | SYSTEM | | | | | | | 744 | | | |

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

```
------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

  8/77  SYSTEM                                                              744

  9/77  SYSTEM                                                              720

 10/77  SYSTEM                                                              744

 11/77  SYSTEM                                                              720

 12/77  SYSTEM                                                              744

  1/78  SYSTEM                                                              744

  2/78  SYSTEM       38.0        38.0                    38.0               672   672    252

        ** PROBLEMS/SOLUTIONS/COMMENTS
                              THERE HAVE BEEN MANY MAINTENANCE PROBLEMS AND PROBLEMS WITH LINER FAILURES.
                              SINCE SHIFTING FROM SO2 TO PARTICULATE SCRUBBING ONLY, PLUGGING PROBLEMS
                              HAVE NOT OCCURRED.  LOW PH HAS CAUSED CORROSION WHICH WAS AGGRAVATED BY
                              PARTICULATE ERROSION.  THE UTILITY WILL PROBABLY RELINE WITH A FLAKE GLASS
                              TYPE LINER.  NO CHEMICALS (E.G. LIME) ARE ADDED TO THE CIRCULATING LIQUOR
                              FOR PH BALANCE.
                              OUTAGE TIME WAS CAUSED BY LEAK REPAIRS IN SLURRY PIPING.

  3/78  SYSTEM       21.0        22.0                    21.0               744   717    156

        ** PROBLEMS/SOLUTIONS/COMMENTS
                              OUTAGE TIME WAS DUE TO RUBBER LINING FAILURE IN THE RECYCLE PUMP DISCHARGE
                              LINE.

  4/78  SYSTEM       80.7        79.8                    76.4               720   689    550

        ** PROBLEMS/SOLUTIONS/COMMENTS
                              26 HOURS OF OUTAGE TIME WERE DUE TO SMALL LEAKS IN PIPING.

  5/78  SYSTEM       84.5        82.7                    74.0               744   666    551

        ** PROBLEMS/SOLUTIONS/COMMENTS
                              A LEAK OCCURRED IN A MIST ELIMINATOR DRAIN.
                              THERE WAS A LEAK IN A BLEED LINE FOR THE SCRUBBER RECYCLE CIRCUIT.
                              OUTAGE TIME WAS REQUIRED FOR BLEED LINE REPLACEMENT.

  6/78  SYSTEM      100.0        90.1                    68.7               720   549    495

  7/78  SYSTEM      100.0          .0                      .0               744    16      0

        ** PROBLEMS/SOLUTIONS/COMMENTS
                              THE VENTURI SCRUBBER HAD AN AVAILABILITY OF 100% FOR JUNE AND JULY.  THE
                              ONLY VENTURI OUTAGE TIME WAS IN JUNE.  THE OUTAGE TIME WAS REQUIRED TO
                              TIE IN EQUIPMENT COMMON TO THE NEW UNIT AND UNIT 3.
                              THE BOILER WAS DOWN IN JULY FOR AN OVERHAUL.
                              THE REASON VENTURI HOURS CAN BE LOWER THAN BOILER HOURS WHEN THE VENTURI
                              HAS A 100% AVAILABILITY IS BECAUSE THE VENTURI IS NOT OPERATED UNDER LOW
                              LOAD CONDITIONS.

  8/78  SYSTEM                                                              744

  9/78  SYSTEM                                                              720

 10/78  SYSTEM                                                              744

 11/78  SYSTEM                                                              720

 12/78  SYSTEM                                                              744

  1/79  SYSTEM                                                              744

  2/79  SYSTEM                                                              672

  3/79  SYSTEM                                                              744
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POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

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-------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

  4/79  SYSTEM                                                              720

  5/79  SYSTEM                                                              744

      ** PROBLEMS/SOLUTIONS/COMMENTS
                            SCRUBBER OUTAGE HOURS SINCE SEPTEMBER 1978 (I.E. SEPTEMBER 1978 THROUGH
                            MAY 30, 1979) TOTAL 140.  THE UTILITY INDICATED THAT IT IS NO LONGER ALLOW-
                            ABLE TO BYPASS THE SCRUBBER WHEN PROBLEMS OCCUR, CLEANING THE PARTICULATE
                            MATTER SOLELY WITH THE ESP.  THE UTILITY MUST DROP THE BOILER LOAD SO THE
                            UNIT REMAINS IN COMPLIANCE.
                            THERE HAVE BEEN NO PROBLEMS REPORTED FOR THE LAST FEW MONTHS.  THE UTILITY
                            IS KEEPING AHEAD OF PROBLEMS WITH A CONSCIENTIOUS INSPECTION AND MAINTEN-
                            ANCE PROGRAM.

  6/79  SYSTEM                                                              720

  7/79  SYSTEM                                                              744

  8/79  SYSTEM                                                              744

  9/79  SYSTEM                                                              720

 10/79  SYSTEM                  98.6                     95.4               744   720    710

      ** PROBLEMS/SOLUTIONS/COMMENTS
                            A TEN HOUR OUTAGE OCCURRED FOR REPAIRS OF A LEAD LINE LEAK.

 11/79  SYSTEM                  95.2                     88.8               720   672    640

      ** PROBLEMS/SOLUTIONS/COMMENTS
                            IN NOVEMBER, 8 HOURS OUTAGE TIME WAS REQUIRED TO REPAIR A LEAK IN A
                            RECYCLE LINE.

 12/79  SYSTEM                  96.1                     93.5               744   724    696

      ** PROBLEMS/SOLUTIONS/COMMENTS
                            AN OUTAGE FOR GENERAL INSPECTION TOOK PLACE DURING DECEMBER.

  1/80  SYSTEM      78.7        88.2                     78.7               744   664    586

      ** PROBLEMS/SOLUTIONS/COMMENTS
                            DURING JANUARY THE SCRUBBER WAS DOWN TO REPAIR THE FLAKEGLASS LINING.

  2/80  SYSTEM     100.0       100.0                    100.0               696   696    696

  3/80  SYSTEM     100.0       100.0                    100.0               744   744    744

      ** PROBLEMS/SOLUTIONS/COMMENTS
                            DURING FEBRUARY AND MARCH THE SCRUBBER OPERATED WITH NO MAJOR PROBLEMS.
                            SECTION 14
         DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS
-------------------------------------------------------------------------------------------

COMPANY NAME                                  PUBLIC SERVICE OF COLORADO
PLANT NAME                                    ARAPAHOE
UNIT NUMBER                                   4
CITY                                          DENVER
STATE                                         COLORADO
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J          43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW            *******
GROSS UNIT GENERATING CAPACITY - MW             112.0
NET UNIT GENERATING CAPACITY W/FGD - MW         109.8
NET UNIT GENERATING CAPACITY WO/FGD - MW      *******
EQUIVALENT SCRUBBED CAPACITY - MW                11.2

** BOILER DATA
    SUPPLIER                                  ******
    TYPE                                      PULVERIZED COAL
    SERVICE LOAD                              ******
    COMMERCIAL SERVICE DATE                    0/55
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       245.39       ( 520000 ACFM)
    FLUE GAS TEMPERATURE - C                    148.9        ( 300 F)
    STACK HEIGHT - M                          ******         (**** FT)
    STACK TOP DIAMETER - M                    *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 23725.        ( 10200 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                               ******
    AVERAGE ASH CONTENT - %                        9.30
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %                  13.70
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                      .95
    RANGE SULFUR CONTENT - %                  0.6-0.95
    AVERAGE CHLORIDE CONTENT - %                    .01
    RANGE CHLORIDE CONTENT - %                ******

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 23493.        ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                               ******
    AVERAGE ASH CONTENT - %                       12.50
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %                  11.20
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                      .65
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %                    .01
    RANGE CHLORIDE CONTENT - %                ******

** FABRIC FILTER
    NUMBER                                     0
    TYPE                                      NONE

** ESP
    NUMBER                                     1

** MECHANICAL COLLECTOR
    NUMBER                                     1

** PARTICULATE SCRUBBER
    NUMBER                                     1
    TYPE                                      MOBILE PACKED TOWER
    SUPPLIER                                  AIR CORRECTION DIVISION, UOP
    NUMBER OF STAGES                              3
    SHELL MATERIAL                            CARBON STEEL
    LINING MATERIAL                           RUBBER
    INTERNAL MATERIAL                         STAINLESS STEEL GRIDS, PLASTIC SPHERES
    BOILER LOAD/SCRUBBER - %                    100.0
    FLUE GAS CAPACITY - CU.M/S                  245.4        ( 520000 ACFM)
```

PUBLIC SERVICE OF COLORADO: ARAPAHOE 4 (CONT.)

| | | |
|---|---|---|
| FLUE GAS TEMPERATURE - C | 151.7 | ( 305 F) |
| L/G RATIO - LITER/CU.M | 7.5 | (56.0 GAL/1000ACF) |
| PRESSURE DROP - KPA | ******* | (***** IN-H2O) |
| SUPERFICIAL GAS VELOCITY - M/S | 3.4 | ( 11.0 FT/S) |
| PARTICULATE INLET LOAD - G/CU.M | 1.8 | ( .80 GR/SCF) |
| PARTICULATE OUTLET LOAD - G/CU.M | .0 | ( .020 GR/SCF) |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 93.0 | |
| SO2 INLET CONCENTRATION - PPM | 500.000 | |
| SO2 OUTLET CONCENTRATION - PPM | 350.000 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 30.0 | |

-------------------------------------------PERFORMANCE DATA-------------------------------------------

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | | | | | | | 744 | | | |
| 11/79 | SYSTEM | | | | | | | 720 | | | |
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER REHEATER FAILURES OCCURRED.

LEAKAGE IN THE INLINE STEAM TUBES HAS BEEN ENCOUNTERED. CORROSION IS KNOWN TO OCCUR AFTER LEAKS ARE EXPERIENCED.

THE PRIMARY PROBLEM WITH THE SYSTEM IS THE INABILITY TO ISOLATE MODULES. IF A PROBLEM OCCURS NO MODULE MAINTENANCE CAN BE PERFORMED UNLESS THE UNIT LOAD IS CUT BACK OR THE UNIT IS SHUT DOWN.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE ISOLATION PROBLEMS CONTINUED THROUGH THE FIRST QUARTER 1980.

USE OF THE CARBON STEEL DAMPERS HAS BEEN ABANDONED. THE PROGRAM FOR REPLACING THE DAMPERS HAS BEEN SUSPENDED INDEFINITELY.

REHEATER STEAM TUBE LEAKS ARE STILL CAUSING PROBLEMS. THE 6 STEAM COILS ON THIS IN-LINE REHEAT SYSTEM, 2 OF WHICH ARE 316SS AND 4 OF WHICH ARE CARBON STEEL, ARE EXPERIENCING CORROSION PROBLEMS. A SOLUTION TO THE PROBLEM HAS NOT YET BEEN DETERMINED.

IN FEBRUARY THE UTILITY REPLACED THE SCRUBBER BALLS AND GRIDS. THEY WERE REPLACED WITH THE NEW HOLLOW HARD PLASTIC-WALLED BALLS WITH NOTCHED SEAMS. THE GRIDS WERE ORIGINALLY 316L SS, CERAMIC, POLYPROPYLENE, AND RUBBER LINE CARBON STEEL, BUT HAVE BEEN REPLACED WITH 317L SS GRIDS.

THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE QUARTER EXCEPT FOR BALL AND GRID REPLACEMENT DOWNTIME.

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

```
COMPANY NAME                                 PUBLIC SERVICE OF COLORADO
PLANT NAME                                   CHEROKEE
UNIT NUMBER                                  1
CITY                                         DENVER
STATE                                        COLORADO
REGULATORY CLASSIFICATION                    ******
PARTICULATE EMISSION LIMITATION - NG/J         43.         (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J               ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW            710.0
GROSS UNIT GENERATING CAPACITY - MW           115.0
NET UNIT GENERATING CAPACITY W/FGD - MW       100.0
NET UNIT GENERATING CAPACITY WO/FGD - MW      115.0
EQUIVALENT SCRUBBED CAPACITY - MW             102.2

** BOILER DATA
    SUPPLIER                                 BABCOCK & WILCOX
    TYPE                                     PULVERIZED COAL
    SERVICE LOAD                             ******
    COMMERCIAL SERVICE DATE                   0/57
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       245.39       ( 520000 ACFM)
    FLUE GAS TEMPERATURE - C                    146.1        ( 295 F)
    STACK HEIGHT - M                         ******          (**** FT)
    STACK TOP DIAMETER - M                   *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                COAL
    FUEL GRADE                               BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                23493.         ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                               ******
    AVERAGE ASH CONTENT - %                      12.50
    RANGE ASH CONTENT - %                    9.4-12.5
    AVERAGE MOISTURE CONTENT - %                 11.30
    RANGE MOISTURE CONTENT - %               ******
    AVERAGE SULFUR CONTENT - %                     .65
    RANGE SULFUR CONTENT - %                 ******
    AVERAGE CHLORIDE CONTENT - %                   .01
    RANGE CHLORIDE CONTENT - %               ******

** FABRIC FILTER
    NUMBER                                    0
    TYPE                                     NONE

** ESP
    NUMBER                                    1

** MECHANICAL COLLECTOR
    NUMBER                                    1

** PARTICULATE SCRUBBER
    NUMBER                                    1
    TYPE                                     MOBILE PACKED TOWER
    SUPPLIER                                 AIR CORRECTION DIVISION, UOP
    NUMBER OF STAGES                              3
    SHELL MATERIAL                           CARBON STEEL
    LINING MATERIAL                          RUBBER
    INTERNAL MATERIAL                        STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES
    BOILER LOAD/SCRUBBER - %                     67.0
    FLUE GAS CAPACITY - CU.M/S                  164.4        ( 348400 ACFM)
    FLUE GAS TEMPERATURE - C                    146.1        (  295 F)
    L/G RATIO - LITER/CU.M                        7.5        (56.0 GAL/1000ACF)
    PRESSURE DROP - KPA                      *******         (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                3.4        (    11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M               1.8        (    .80 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M               .0        (  .020 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %    97.0
    SO2 INLET CONCENTRATION - PPM              500.000
    SO2 OUTLET CONCENTRATION - PPM             420.000
    SO2 DESIGN REMOVAL EFFICIENCY - %            16.0
```

## PUBLIC SERVICE OF COLORADO: CHEROKEE 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | | | | | | | 744 | | | |
| 11/79 | SYSTEM | | | | | | | 720 | | | |
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD ID FAN FAILURES HAVE OCCURRED DUE TO EROSION FROM THE FLYASH.

THE ISOLATION DAMPER HAS BEEN A PROBLEM DUE TO FREEZE UPS MAKING IT INOPERATIVE.

REHEATER FAILURES HAVE OCCURRED DUE TO PLUGGING OF THE HOT AIR INJECTION STEAM COILS.

THE SCRUBBER EXIT DUCTWORK WILL BE REPAIRED TEMPORARILY WITH A SPRAY ON FIBERGLASS-LIKE MATERIAL.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE FIRST QUARTER 1980.

THE ISOLATION DAMPERS HAVE NOT CAUSED ANY PROBLEMS BECAUSE THERE USE HAS NOT BEEN NECESSARY.

THE FANS ARE STILL EXPERIENCING EROSION PROBLEMS.

ON MAY 24TH A BOILER/SCRUBBER OVERHAUL WILL BEGIN. DURING THIS TIME THE CARBON STEEL ISOLATION DAMPERS WILL BE REPLACED WITH 316 SS. THE NEW FANS WILL BE INSTALLED IN THE OLD HOUSINGS. THE NEW HIGH STRENGTH CARBON STEEL FANS WILL CONTAIN REPLACABLE CHROMIUM ALLOY WEAR PLATE-TIPS ON THE BLADES.

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

```
COMPANY NAME                                    PUBLIC SERVICE OF COLORADO
PLANT NAME                                      CHEROKEE
UNIT NUMBER                                     4
CITY                                            DENVER
STATE                                           COLORADO
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J            43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               710.0
GROSS UNIT GENERATING CAPACITY - MW              375.0
NET UNIT GENERATING CAPACITY W/FGD - MW          350.0
NET UNIT GENERATING CAPACITY WO/FGD - MW         375.0
EQUIVALENT SCRUBBED CAPACITY - MW                356.4

** BOILER DATA
     SUPPLIER                                   COMBUSTION ENGINEERING
     TYPE                                       PULVERIZED COAL
     SERVICE LOAD                               ******
     COMMERCIAL SERVICE DATE                     0/68
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        717.29        (1520000 ACFM)
     FLUE GAS TEMPERATURE - C                     135.0         ( 275 F)
     STACK HEIGHT - M                           ******         (**** FT)
     STACK TOP DIAMETER - M                     *******        (***** FT)

** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                  23493.         ( 10100 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                 ******
     AVERAGE ASH CONTENT - %                        12.50
     RANGE ASH CONTENT - %                      9.4-12.5
     AVERAGE MOISTURE CONTENT - %                   11.30
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                       .65
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %                     .01
     RANGE CHLORIDE CONTENT - %                 ******

** FABRIC FILTER
     NUMBER                                      0
     TYPE                                       NONE

** ESP
     NUMBER                                      1

** MECHANICAL COLLECTOR
     NUMBER                                      1

** PARTICULATE SCRUBBER
     NUMBER                                      4
     TYPE                                       MOBILE PACKED TOWER
     SUPPLIER                                   AIR CORRECTION DIVISION, UOP
     NUMBER OF STAGES                                3
     SHELL MATERIAL                             CARBON STEEL
     LINING MATERIAL                            RUBBER
     INTERNAL MATERIAL                          STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES
     L/G RATIO - LITER/CU.M                         7.5         (56.0 GAL/1000ACF)
     PRESSURE DROP - KPA                        *******        (***** IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S                 3.4         (    11.0 FT/S)
     PARTICULATE INLET LOAD - G/CU.M                1.6         (    .70 GR/SCF)
     PARTICULATE OUTLET LOAD - G/CU.M                .0         (   .020 GR/SCF)
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     97.0
     SO2 INLET CONCENTRATION - PPM                500.000
     SO2 OUTLET CONCENTRATION - PPM               420.000
     SO2 DESIGN REMOVAL EFFICIENCY - %             16.0
```

PUBLIC SERVICE OF COLORADO: CHEROKEE 4 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | | | | | | | 744 | | | |
| 11/79 | SYSTEM | | | | | | | 720 | | | |
| 12/79 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD ID FAN FAILURES HAVE OCCURRED DUE TO EROSION FROM THE FLYASH.

THE ISOLATION DAMPER HAS BEEN A PROBLEM DUE TO FREEZE UPS MAKING IT INOPERATIVE.

REHEATER FAILURES HAVE OCCURRED DUE TO PLUGGING OF THE HOT AIR INJECTION STEAM COILS.

THE SCRUBBER EXIT DUCTWORK WILL BE REPAIRED TEMPORARILY WITH A SPRAY ON FIBERGLASS LIKE MATERIAL.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | | | | | | | 744 | | | |
| 2/80 | SYSTEM | | | | | | | 696 | | | |
| 3/80 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER/SCRUBBER OUTAGE BEGAN IN MID-MARCH AND IS SCHEDULED TO CONTINUE THROUGH EARLY MAY. THE OUTLET DUCT WORK IS BEING REBUILT INTERNALLY WITH FIBERGLASS FOR STRUCTURAL SUPPORT AND ACID RESISTANCE. WITH REGULAR MAINTENANCE THE UTILITY EXPECTS THIS TO PROVE TO BE A PERMANENT SOLUTION.

ALSO DURING THE OUTAGE A SECOND LAYER OF VERTICAL GRIDS IS BEING INSTALLED ON THE THREE LAYER MOBLE BED TOWER. THE VERTICAL GRIDS SHOULD CHECK THE POTENTIAL FOR SIDE TO SIDE BALL MIGRATION.

THE OLD FANS ARE BEING REPLACED WITH HIGH STRENGTH CARBON STEEL FANS HAVING REPLACABLE CHROMIUM ALLOY WEAR PLATE BLADE TIPS.

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

```
COMPANY NAME                                    PUBLIC SERVICE OF COLORADO
PLANT NAME                                      VALMONT
UNIT NUMBER                                     5
CITY                                            VALMONT
STATE                                           COLORADO
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J            43.         (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                273.8
GROSS UNIT GENERATING CAPACITY - MW               166.0
NET UNIT GENERATING CAPACITY W/FGD - MW           157.0
NET UNIT GENERATING CAPACITY WO/FGD - MW          163.0
EQUIVALENT SCRUBBED CAPACITY - MW                 166.0

** BOILER DATA
    SUPPLIER                                    COMBUSTION ENGINEERING
    TYPE                                        PULVERIZED COAL
    SERVICE LOAD                                BASE
    COMMERCIAL SERVICE DATE                      0/64
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         436.98        ( 926000 ACFM)
    FLUE GAS TEMPERATURE - C                      126.7         ( 260 F)
    STACK HEIGHT - M                            ******          (**** FT)
    STACK TOP DIAMETER - M                      *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                   25121.         ( 10800 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                  ******
    AVERAGE ASH CONTENT - %                         6.00
    RANGE ASH CONTENT - %                       5.4-7.0
    AVERAGE MOISTURE CONTENT - %                  15.00
    RANGE MOISTURE CONTENT - %                  12.7-18.3
    AVERAGE SULFUR CONTENT - %                      .70
    RANGE SULFUR CONTENT - %                    0.68-.73
    AVERAGE CHLORIDE CONTENT - %                ********
    RANGE CHLORIDE CONTENT - %                  ******

** FABRIC FILTER
    NUMBER                                       0
    TYPE                                        NONE

** ESP
    NUMBER                                       1
    TYPE                                        COLD SIDE
    FLUE GAS CAPACITY - CU.M/S                    218.5         ( 463000 ACFM)

** MECHANICAL COLLECTOR
    NUMBER                                       1
    FLUE GAS CAPACITY - CU.M/S                    218.5         ( 463000 ACFM)

** PARTICULATE SCRUBBER
    NUMBER                                       2
    TYPE                                        MOBILE PACKED TOWER
    SUPPLIER                                    AIR CORRECTION DIVISION, UOP
    NUMBER OF STAGES                               3
    SHELL MATERIAL                              CARBON STEEL
    LINING MATERIAL                             RUBBER
    INTERNAL MATERIAL                           STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES
    TYPE OF NOZZLES                             25.
    BOILER LOAD/SCRUBBER - %                       36.0
    FLUE GAS CAPACITY - CU.M/S                    109.2         ( 231500 ACFM)
    FLUE GAS TEMPERATURE - C                      132.8         (  271 F)
    L/G RATIO - LITER/CU.M                          7.8         (58.3 GAL/1000ACF)
    PRESSURE DROP - KPA                         *******         (***** IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                  3.4         (    11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                 1.8         (    .80 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M                 .0         (  .020 GR/SCF)
    SO2 INLET CONCENTRATION - PPM                 500.000
    SO2 DESIGN REMOVAL EFFICIENCY - %              40.0
```

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/74 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS ORIGINALLY INSTALLED FOR PARTICULATE REMOVAL SINCE THE PLANT BURNS LOW SULFUR COAL; HOWEVER, 45% OF THE SO2 IS REMOVED AS WELL BECAUSE OF THE ALKALINITY OF THE FLYASH.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/74 | SYSTEM | | | | | | | 720 | | | |
| 12/74 | SYSTEM | | | | | | | 744 | | | |
| 1/75 | SYSTEM | | | | | | | 744 | | | |
| 2/75 | SYSTEM | | | | | | | 672 | | | |
| 3/75 | SYSTEM | | | | | | | 744 | | | |
| 4/75 | SYSTEM | | | | | | | 720 | | | |
| 5/75 | SYSTEM | | | | | | | 744 | | | |
| 6/75 | SYSTEM | | | | | | | 720 | | | |
| 7/75 | SYSTEM | | | | | | | 744 | | | |
| 8/75 | SYSTEM | | | | | | | 744 | | | |
| 9/75 | SYSTEM | | | | | | | 720 | | | |
| 10/75 | SYSTEM | | | | | | | 744 | | | |
| 11/75 | SYSTEM | | | | | | | 720 | | | |
| 12/75 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST YEAR OF OPERATION PROBLEMS INCLUDED DIFFICULTIES WITH THE MODULE PACKING GRID SUPPORT, GENERAL VESSEL SCALE FORMATION, FLOW DISTRIBUTION PROBLEMS, BALL BREAKAGE, SCALING IN THE MIST ELIMINATOR SECTION, AND PLUGGING OF THE REHEATER. SCALE FORMATION WAS THE MOST PREDOMINANT - CONTINUING MAJOR CAUSE OF DOWNTIME IN THE SCRUBBER. SCALE ACCUMULATION WAS NOTED ON THE WET-DRY INTERFACE IMMEDIATELY DOWNSTREAM OF THE PRESATURATION NOZZLES. SCALE ALSO ACCUMULATED HEAVILY ON THE UNDERSIDE OF THE FIRST LAYER OF GRID BARS.

SCALE ON THE UPPER GRID BARS WAS LESS PREVALENT AS THE ACTION OF THE "PING PONG" BALLS TENDED TO KEEP THE SCALE OFF OF THESE SECTIONS. SCALE ALSO COLLECTED ON THE WALLS OF THE VESSEL AND INTERMITTENTLY SLOUGHED OFF AND FELL INTO THE SUMP IN LARGE PIECES CAUSING BLOCKAGE OF THE RECIRCULATION PUMP SUCTION SCREENS. SCALING OF THE MIST ELIMINATOR ABATED SOMEWHAT WITH THE INTRODUCTION OF A CLEAR RINSE WATER WASH. SCALE FORMATION IN THE REHEAT SECTION SOMETIMES REQUIRED SUPPLEMENTAL CLEANING OF THE REHEATER IN ADDITION TO THE CLEANING OBTAINED BY THE USE OF THE SOOTBLOWERS WHICH WERE INSTALLED AS A PART OF THE REHEATER EQUIPMENT. UNDER NORMAL OPERATION, THE SOOTBLOWERS LOCATED IN THIS REHEAT SECTION WERE FAIRLY SUCCESSFUL IN REMOVING THE ACCUMULATION OF THE SCALE IN THE REHEATER.

ALTHOUGH MANY OF THE INITIAL START-UP PROBLEMS WERE SOLVED OVER A PERIOD OF TIME, THE CALCIUM SULFATE-FLYASH SCALING CONTINUED TO BE A SIGNIFICANT OPERATING PROBLEM AT THE VALMONT INSTALLATION. IN ADDITION TO THESE SCALING RELIABILITY PROBLEMS, A WATER QUALITY CONCERN ALSO SURFACED THAT WAS A DIRECT RESULT OF THE PARTICULATE SCRUBBER OPERATION. THE RELATIVELY HIGH CAO CONCENTRATION IN THE VALMONT FLYASH RESULTED IN FAIRLY HIGH SO2 REMOVAL RATES (45-50 PERCENT) WITHIN THE UNITS. SINCE NO PH CONTROL CAPABILITY FOR EITHER THE RECIRCULATING SLURRY OR THE SYSTEM BLOWDOWN SLURRY WAS DESIGNED INTO THE SYSTEM, AN ACID CONDITION WAS CREATED IN THE SLURRY AND THE BLOWDOWN STREAM. PH LEVELS OF THE BLOWDOWN NORMALLY RANGED BETWEEN 1.7 AND 2.0. ALTHOUGH THE STREAM WAS NEUTRALIZED TO A DEGREE BY ALKALINE FLYASH, PSCC FELT THAT IT WAS IMPORTANT TO INVESTIGATE VARIOUS CONTROL MEASURES WHICH COULD BE APPLIED TO THIS STREAM. THE CALCIUM SULFATE SCALING PROBLEM WAS THOUGHT TO BE THE RESULT OF A SUPER-SATURATED CALCIUM

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERFORMANCE DATA

SULFATE CONDITION IN THE RECIRCULATING SLURRY. BECAUSE OF THIS IT WAS FELT THAT CONTINUOUS PH CONTROL OF THE RECIRCULATING SLURRY, CONVERSION OF THE SYSTEM TO CLOSED LOOP OPERATION AND ESTABLISHING A HIGHER CONCENTRATION OF SEEDING SOLIDS IN THE RECIRCULATION SLURRY (THEREBY CONTROLLING THE SCALING PROBLEMS WITHOUT CHEMICAL ADDITIVES) WOULD BE NECESSARY MEASURES.

FOR PH CONTROL, LIMESTONE WAS TESTED INITIALLY, THEN LIME WAS UTILIZED FOR THE ALKALI REAGENT. IN THE FIRST TEST, SINCE LIMESTONE UTILIZATION WAS A MAJOR CONCERN, A SPECIAL EFFORT WAS MADF TO REDUCE THE POTENTIAL FOR THE SHORT CIRCUITING OF THE ADDED LIMESTONE AND TO PROVIDE SUFFICIENT RESIDENCE TIME IN THE REACTOR SECTION OF THE SYSTEM. BY UTILIZING FOUR REATION MIX TANKS IN SERIES, PLUG FLOW WAS EXPECTED TO BE MORE CLOSELY SIMULATED. TO MAINTAIN A CLOSED LOOP SYSTEM WHERE THE QUANTITY OF WATER REMOVED FROM THE SYSTEM WAS HELD TO A MINIMUM, FOUR SYSTEM DESIGN FEATURES WERE UTILIZED.

1. UTILIZATION OF A COMBINATION OF POND SUPERNATANT AND MAKE-UP WATER FOR RECYCLE WATER.
2. PRESATURATION OF THE INCOMING FLUE GAS WITH RECIRCULATING SLURRY.
3. INTERMITTENT MIST ELIMINATOR WASH.
4. PROPER SELECTION OF MATERIALS OF CONSTRUCTION TO PROTECT AGAINST ATTACK CAUSED BY HIGH CHLORIDE CONCENTRATIONS.

THE SCRUBBERS R & D FACILITY WAS NOT EQUIPPED WITH A MECHANICAL THICKENER FOR CONTROL OF THE SUSPENDED SOLIDS CONCENTRATION OF THE RECIRCULATING SLURRY (ALL PURGED MATERIAL WAS SENT TO THE SLUDGE POND). WITH A 500 PPM SO2 CONCENTRATION IN THE FLUE GAS, IT IS EXPECTED THAT THE RECIRCULATING SLURRY SOLIDS COULD BE REALLY CONTROLLED IN THE 5 TO 7 PERCENT RANGE. DUE TO THE MIXED FUEL FIRED AT THE UNIT DURING THE TEST PERIOD, HOWEVER, THE SO2 CONCENTRATIONS EMITTED FROM THE BOILER AND HENCE PRESENT IN THE FLUE GAS STREAM VARIED SIGNIFICANTLY AND FINALLY FELL TO SUCH LOW LEVELS (OFTEN 100-200 PPM) THAT SUSPENDED SOLIDS CONCENTRATIONS IN THE SLURRY COULD NOT BE MAINTAINED. IT IS ALMOST CERTAIN THAT A THICKENER, WITH THE SUBSEQUENT RETURN OF SOLIDS TO THE SCRUBBER LIQUOR, COULD HAVE BEEN USED TO GOOD ADVANTAGE DURING THIS TIME PERIOD. GENERALLY SPEAKING, THE SEVERE SCALING CONDITIONS PLAGUING THE TEST MODULE WERE INTENSIFIED DURING THESE PERIODS OF LOW INLET SO2 CONDITION.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/76 | SYSTEM | | | | | | | 744 | | | |
| 2/76 | SYSTEM | | | | | | | 696 | | | |
| 3/76 | SYSTEM | | | | | | | 744 | | | |
| 4/76 | SYSTEM | | | | | | | 720 | | | |
| 5/76 | SYSTEM | | | | | | | | | | |
| 6/76 | SYSTEM | | | | | | | 720 | | | |
| 7/76 | SYSTEM | | | | | | | 744 | | | |
| 8/76 | SYSTEM | | | | | | | 744 | | | |
| 9/76 | SYSTEM | | | | | | | 720 | | | |
| 10/76 | SYSTEM | | | | | | | 744 | | | |
| 11/76 | SYSTEM | | | | | | | 720 | | | |
| 12/76 | SYSTEM | | | | | | | 744 | | | |
| 1/77 | SYSTEM | | | | | | | 744 | | | |
| 2/77 | SYSTEM | | | | | | | 672 | | | |
| 3/77 | SYSTEM | | | | | | | 744 | | | |
| 4/77 | SYSTEM | | | | | | | 720 | | | |
| 5/77 | SYSTEM | | | | | | | 744 | | | |
| 6/77 | SYSTEM | | | | | | | 720 | | | |
| 7/77 | SYSTEM | | | | | | | 744 | | | |

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/77 | SYSTEM | | | | | | | 744 | | | |
| 9/77 | SYSTEM | | | | | | | 720 | | | |
| 10/77 | SYSTEM | | | | | | | 744 | | | |
| 11/77 | SYSTEM | | | | | | | 720 | | | |
| 12/77 | SYSTEM | | | | | | | 744 | | | |
| 1/78 | SYSTEM | | | | | | | 744 | | | |
| 2/78 | SYSTEM | | | | | | | 672 | | | |
| 3/78 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THERE HAVE BEEN RECURRING PROBLEMS ASSOCIATED WITH BALL MIGRATION IN THE BALL COMPARTMENT AS WELL AS RECIRCULATION PUMP MOTOR BEARING FAILURE, AND WEAR AND FAILURE IN THE BALL COMPARTMENT LINING. THERE HAVE BEEN CONTINUAL PROBLEMS WITH REHEATER PLUGGING. THERE ALSO HAVE BEEN EXPANSION JOINT FAILURES AT BOTH THE INLET AND OUTLET OF THE SCRUBBER.

MORE RECENTLY THERE WAS A PINCH BELT FAILURE.

THE SCRUBBING SYSTEM HAS HAD AN AVAILABILITY RANGE OF 50 TO 79% WITH AN AVERAGE OF 66%.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/78 | SYSTEM | | | | | | | 720 | | | |
| 5/78 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

NO SIGNIFICANT PROBLEMS WERE ENCOUNTERED.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/78 | SYSTEM | | | | | | | 720 | | | |
| 7/78 | SYSTEM | | | | | | | 744 | | | |
| 8/78 | SYSTEM | | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAD NO COMMENTS FOR THIS PERIOD.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/78 | SYSTEM | | | | | | | 720 | | | |
| 10/78 | SYSTEM | | | | | | | 744 | | | |
| 11/78 | SYSTEM | | | | | | | 720 | | | |
| 12/78 | SYSTEM | | | | | | | 744 | | | |
| 1/79 | SYSTEM | | | | | | | 744 | | | |
| 2/79 | SYSTEM | | | | | | | 672 | | | |
| 3/79 | SYSTEM | | | | | | | 744 | | | |
| 4/79 | SYSTEM | | | | | | | 720 | | | |
| 5/79 | SYSTEM | | | | | | | 744 | | | |
| 6/79 | SYSTEM | | | | | | | 720 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

AVERAGE SCRUBBER AVAILABILITY FROM START UP THROUGH APRIL 1979 WAS 64.42%.

AVERAGE SCRUBBER AVAILABILITY FOR 1978 WAS 66.85%.

AVERAGE SCRUBBER AVAILABILITY FROM JANUARY 1, 1979 THROUGH MAY, 1979 WAS APPROXIMATELY 80%.

BALL MIGRATION, ALTHOUGH NOT SERIOUS, IS A CHRONIC PROBLEM FOR VALMONT 5.

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERFORMANCE DATA

EROSION AND CORROSION HAVE OCCURRED ON THE SCRUBBER GRID BAR AREA (PACKING SUPPORT).
EROSION/CORROSION IS EVIDENT IN THE MIST ELIMINATOR SECTION.
EROSION/CORROSION OCCURRS IN THE REHEATER AREA AND SOOT BLOWER.
THE UTILITY HAD TO REPLACE INLET AND OUTLET EXPANSION JOINTS.
REHEATER PLUGGING HAS BEEN A PROBLEM.
RECYCLE PUMP BEARING FAILURES OCCURRED.
THE JACK SCREW DRIVE HAS BEEN MALFUNCTIONING ON INLET AND OUTLET ISOLATION DAMPERS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/79 | SYSTEM | | | | | | | 744 | | | |
| 8/79 | SYSTEM | | | | | | | 744 | | | |
| 9/79 | SYSTEM | | | | | | | 720 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE ANNUAL SHUTDOWN IN SEPTEMBER THE OLD SCRUBBER BALLS WERE REPLACED WITH A NEW BRAND. DUE TO BALL MOTION THE RUBBER LINER ERODED. IN THE MIST ELIMINATOR SECTION EROSION AND CORROSION OCCURRED.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | 100.0 | | | | | | 744 | | | |
| 11/79 | SYSTEM | 92.3 | | | | | | 720 | | | |
| 12/79 | SYSTEM | 98.1 | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

ONE OF THE MAJOR SYSTEM PROBLEMS IS THE SCRUBBER WALL WEAR WHICH HAS TO BE PATCHED DURING THE SPRING AND FALL.
REHEATER PLUGGING HAS BEEN A CHRONIC PROBLEM.
THE UTILITY HAS REPORTED THE FOLLOWING ANNUAL AVAILABILITIES FOR THE UNIT.

1972 - 1978: 64.3%
1972 - 1979: 65.9%
1978: 66.8%
1979: 80.5%

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | A | 98.5 | | | | | | | | | |
| | B | 98.5 | | | | | | | | | |
| | SYSTEM | 98.5 | | | | | | 744 | | | |
| 2/80 | A | 84.4 | | | | | | | | | |
| | B | 94.9 | | | | | | | | | |
| | SYSTEM | 89.7 | | | | | | 696 | | | |
| 3/80 | A | 85.0 | | | | | | | | | |
| | B | 85.0 | | | | | | | | | |
| | SYSTEM | 85.0 | | | | | | 744 | | | |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1980, NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBER.

## SECTION 14
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                        SOUTHWESTERN PUBLIC SERVICE
PLANT NAME                                          HARRINGTON
UNIT NUMBER                                         1
CITY                                                AMARILLO
STATE                                               TEXAS
REGULATORY CLASSIFICATION                           ******
PARTICULATE EMISSION LIMITATION - NG/J                43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                       516.          ( 1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                   360.0
GROSS UNIT GENERATING CAPACITY - MW                  360.0
NET UNIT GENERATING CAPACITY W/FGD - MW             *******
NET UNIT GENERATING CAPACITY WO/FGD - MW            *******
EQUIVALENT SCRUBBED CAPACITY - MW                   *******

** BOILER DATA
    SUPPLIER                                        COMBUSTION ENGINEERING
    TYPE                                            PULVERIZED COAL
    SERVICE LOAD                                    BASE
    COMMERCIAL SERVICE DATE                          8/76
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S            778.63        (1650000 ACFM)
    FLUE GAS TEMPERATURE - C                         176.7         ( 350 F)
    STACK HEIGHT - M                                  76.          ( 250 FT)
    STACK TOP DIAMETER - M                              .8         (  2.7 FT)

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                       19538.        (  8400 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                     8000-8900
    AVERAGE ASH CONTENT - %                             5.00
    RANGE ASH CONTENT - %                           4.5-6
    AVERAGE MOISTURE CONTENT - %                       27.10
    RANGE MOISTURE CONTENT - %                      25-30
    AVERAGE SULFUR CONTENT - %                           .42
    RANGE SULFUR CONTENT - %                        .39-.45
    AVERAGE CHLORIDE CONTENT - %                    ********
    RANGE CHLORIDE CONTENT - %                      ******

** ESP
    NUMBER                                           1
    TYPE                                            COLD SIDE
    SUPPLIER                                        RESEARCH COTTRELL
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          95.0
    FLUE GAS CAPACITY - CU.M/S                        778.6        (1650000 ACFM)
    FLUE GAS TEMPERATURE - C                          168.3        (  335 F)
    PRESSURE DROP - KPA                             *******        (***** IN-H2O)
    PARTICULATE OUTLET LOAD - G/CU.M                     .18       (    .08 GR/SCF)

** PARTICULATE SCRUBBER
    NUMBER                                           6
    TYPE                                            MOBILE PACKED TOWER
    SUPPLIER                                        COMBUSTION ENGINEERING
    NUMBER OF STAGES                                    1
    SHELL MATERIAL                                  CARBON STEEL
    LINING MATERIAL                                 RIGID LINE POLYESTER
    INTERNAL MATERIAL                               316L SS FIBERGLASS ALLOY 20
    NUMBER OF NOZZLES                                  99
    TYPE OF NOZZLES                                 OPEN PIPE
    BOILER LOAD/SCRUBBER - %                           20.0
    FLUE GAS CAPACITY - CU.M/S                        141.6        ( 300000 ACFM)
    FLUE GAS TEMPERATURE - C                           60.0        (  140 F)
    LIQUID RECIRCULATION RATE - LITER/S               444.1        ( 7050 GPM)
    L/G RATIO - LITER/CU.M                              3.1        (23.0 GAL/1000ACF)
    SUPERFICIAL GAS VELOCITY - M/S                      2.4        (     8.0 FT/S)
    PARTICULATE INLET LOAD - NG/J                      80.         (  .185 LB/MMBTU)
    PARTICULATE OUTLET LOAD - NG/J                     30.         (  .070 LB/MMBTU)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          50.0
    SO2 INLET CONCENTRATION - NG/J                    430.         ( 1.000 LB/MMBTU)
    SO2 OUTLET CONCENTRATION - NG/J                   215.         (  .500 LB/MMBTU)
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SOUTHWESTERN PUBLIC SERVICE: HARRINGTON 1 (CONT.)


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

10/79  SYSTEM                                                               744

11/79  SYSTEM                                                               720

12/79  SYSTEM                                                               744

      ** PROBLEMS/SOLUTIONS/COMMENTS
                         DURING OCTOBER THROUGH DECEMBER, TWO SPRAY PUMP MOTORS FAILED.
                         THE FRP MATERIAL IN THE FLUSH PIPING HAS FAILED CAUSING SOME LEAKAGE.
                         PLUGGING IN ONE MARBLE BED WAS ENCOUNTERED WHEN THE CHEMISTRY CONTROL WAS
                         TEMPORARILY LOST.
                         THE CONE SHAPED EXPANDED METAL SCREEN COVERING THE BED DRAIN PIPES HAS    E
                         ERODED AWAY FROM BALL MOVEMENT.  THE MARBLE BALLS HAVE BEEN DROPPING INTO Y
                         THE CONE SHAPED EXPANDED METAL SCREEN COVERING THE BED DRAIN PIPES HAS    E
                         ERODED AWAY FROM BALL MOVEMENT.  THE MARBLE BALLS HAVE BEEN DROPPING INTO Y
                         THE RECYCLE TANK.  WHERE THE UTILITY HAS REPLACED THE METAL SCREEN WITH ANE
                         THE CONE SHAPED EXPANDED METAL SCREEN COVERING THE BED DRAIN PIPES HAS    E
                         ERODED AWAY FROM BALL MOVEMENT.  THE MARBLE BALLS HAVE BEEN DROPPING INTO Y
                         THE RECYCLE TANK.  WHERE THE UTILITY HAS REPLACED THE METAL SCREEN WITH ANE
                         EXPANDED PLASTIC SCREEN, EROSION HAS NOT OCCURRED.

 1/80  SYSTEM                                                               744

 2/80  SYSTEM                                                               696

 3/80  SYSTEM                                                               744

      ** PROBLEMS/SOLUTIONS/COMMENTS
                         DURING THE FIRST QUARTER 1980 THE MIST ELIMINATOR WASH PIPING RUPTURED
                         CAUSING PLUGGING IN SCRUBBERS 4 AND 5.  THE UTILITY PLANS TO REPLACE
                         ALL FRP PIPING WITH STEEL.  THE RUPTURE ON NO. 5 ALSO DAMAGED THE WATER
                         SUPPLY HEADER.
                         THE MARBLE BED PLUGGING REPORTED DURING THE LAST QUARTER IS NOT YET
                         COMPLETELY CLEARED.  THE SOFT SCALE IS GRADUALLY GOING BACK INTO THE
                         SOLUTION.  THE PLATE AREA IS CLEAN.
                         THE DUCT BENEATH THE REHEATER TUBING ON ONE OF THE MODULES HAS CORRODED TO
                         THE POINT THAT HOLES HAVE FORMED.  SCALE AND MOISTURE WERE FOUND ON THE
                         PLATE WHERE THE CORROSION FORMED.  THE PLATE WAS REMOVED AND A NEW CARBON
                         STEEL PLATE WAS WELDED IN.  NO OTHER REHEATER AREA HAS EXPERIENCED ANY SCA
                         OR MOISTURE.
```

## SECTION 15
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | CHUGOKU ELECTRIC | |
| PLANT NAME | SHIMONOSEKI | |
| UNIT NUMBER | 1 | |
| CITY | SHIMONOSEKI | |
| STATE | | |
| GROSS UNIT GENERATING CAPACITY - MW | 175.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 175.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 175.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 25046. | ( 10768 BTU/LB) |
| AVERAGE ASH CONTENT - % | 24.60 | |
| AVERAGE MOISTURE CONTENT - % | 2.30 | |
| AVERAGE SULFUR CONTENT - % | .59 | |
| AVERAGE CHLORIDE CONTENT - % | .04 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | MITSUBISHI HEAVY INDUSTRIES | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 5/79 | |
| COMMERCIAL START-UP DATE | 7/79 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 85.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | ******** | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** BYPRODUCT | | |
| BYPRODUCT NATURE | GYPSUM | |
| DISPOSITION | | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/79 | SYSTEM | 100.0 | 100.0 | 100.0 | 54.8 | | | 744 | 408 | 408 | |
| 8/79 | SYSTEM | 100.0 | 100.0 | 100.0 | 100.0 | | | 744 | 744 | 744 | |
| 9/79 | SYSTEM | 100.0 | 100.0 | 100.0 | 100.0 | | | 720 | 720 | 720 | |

** PROBLEMS/SOLUTIONS/COMMENTS

COMMERCIAL OPERATIONS BEGAN IN THE MIDDLE OF JULY 1979. THE FGD UNIT HAS OPERATED CONTINUOUSLY THROUGH THE THIRD QUARTER WITH NO PROBLEMS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/79 | SYSTEM | 100.0 | 100.0 | 100.0 | 100.0 | | | 744 | 744 | 744 | |
| 11/79 | SYSTEM | 100.0 | 100.0 | 100.0 | 100.0 | | | 720 | 720 | 720 | |
| 12/79 | SYSTEM | 93.5 | 93.5 | 93.5 | 93.5 | | | 744 | 744 | 696 | |

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD UNIT OPERATED CONTINUOUSLY THROUGH THE FOURTH QUARTER EXCEPT FOR A 2 DAY SHUTDOWN TO INSPECT THE GAS-GAS HEATER DURING DECEMBER. THE BOILER WAS OPERATED FIRING A LOW SULFUR OIL DURING THE TWO DAYS.

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/80 | SYSTEM | 100.0 | 100.0 | 100.0 | 100.0 | | | 744 | 744 | 744 | |
| 2/80 | SYSTEM | 55.2 | 100.0 | 55.2 | 55.2 | | | 6960 | 384 | 384 | |

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL |  | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY AND THE FIRST HALF OF FEBRUARY THE FGD UNIT OPERATED WITH NO PROBLEMS. THE UNIT WAS TAKEN OFF-LINE IN THE MIDDLE OF FEBRUARY FOR SCHEDULED MAINTENANCE.

## SECTION 15
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | ELECTRIC POWER DEVELOPMENT CO. | |
| PLANT NAME | ISOGO | |
| UNIT NUMBER | 1 | |
| CITY | YOKOHAMA | |
| STATE | JAPAN | |
| GROSS UNIT GENERATING CAPACITY - MW | 265.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 238.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 265.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 25958. | ( 11160 BTU/LB) |
| AVERAGE ASH CONTENT - % | 16.00 | |
| AVERAGE MOISTURE CONTENT - % | 7.00 | |
| AVERAGE SULFUR CONTENT - % | .60 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | IHI - CHEMICO | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | ******* | |
| INITIAL START-UP DATE | 12/75 | |
| COMMERCIAL START-UP DATE | 3/76 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 90.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 96.70 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 22.3 | ( 354 GPM) |
| ** BYPRODUCT | | |
| BYPRODUCT NATURE | GYPSUM | |
| DISPOSITION | MARKETED | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/78 | SYSTEM | | | | | | | 720 | | | |
| 5/78 | SYSTEM | | | | | | | 744 | | | |
| 6/78 | SYSTEM | | | | | | | 720 | | | |
| 7/78 | SYSTEM | | | | | | | 744 | | | |
| 8/78 | SYSTEM | | | | | | | 744 | | | |
| 9/78 | SYSTEM | | | | | | | 720 | | | |
| 10/78 | SYSTEM | | | | | | | 744 | | | |
| 11/78 | SYSTEM | | | | | | | 720 | | | |
| 12/78 | SYSTEM | | | | | | | 744 | | | |
| 1/79 | SYSTEM | | | | | | | 744 | | | |
| 2/79 | SYSTEM | | | | | | | 672 | | | |
| 3/79 | SYSTEM | | | | | | | 744 | | | |

ELECTRIC POWER DEVELOPMENT CO.: ISOGO 1 (CONT.)

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           100% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH
                           MARCH 1979.
```

## SECTION 15
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

```
------------------------------------------------------------------------------------------------------------

 COMPANY NAME                                      ELECTRIC POWER DEVELOPMENT CO.
 PLANT NAME                                        ISOGO
 UNIT NUMBER                                       2
 CITY                                              YOKOHAMA
 STATE                                             JAPAN
 GROSS UNIT GENERATING CAPACITY - MW                 265.0
 NET UNIT GENERATING CAPACITY W/FGD - MW             238.0
 EQUIVALENT SCRUBBED CAPACITY - MW                   265.0

 ** FUEL DATA
     FUEL TYPE                                     COAL
     FUEL GRADE                                    ******
     AVERAGE HEAT CONTENT - J/G                     25958.        ( 11160 BTU/LB)
     AVERAGE ASH CONTENT - %                           16.00
     AVERAGE MOISTURE CONTENT - %                       7.00
     AVERAGE SULFUR CONTENT - %                          .60
     AVERAGE CHLORIDE CONTENT - %                  ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                          WET SCRUBBING
     PROCESS TYPE                                  LIMESTONE
     SYSTEM SUPPLIER                               IHI - CHEMICO
     NEW/RETROFIT                                  RETROFIT
     ENERGY CONSUMPTION - %                             3.0
     INITIAL START-UP DATE                          3/76
     COMMERCIAL START-UP DATE                       5/76
     SO2 DESIGN REMOVAL EFFICIENCY - %                90.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %        96.70
     ABSORBER SPARE COMPONENTS INDEX                     .0

 ** WATER LOOP
     TYPE                                          OPEN
     FRESH MAKE-UP WATER - LITER/S                     22.3        (  354 GPM)

 ** BYPRODUCT
     BYPRODUCT NATURE                              GYPSUM
     DISPOSITION                                   MARKETED


-------------------------------------------PERFORMANCE DATA----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ----- ----- ----- ------ ----- ------

 4/78  SYSTEM                                                                720

 5/78  SYSTEM                                                                744

 6/78  SYSTEM                                                                720

 7/78  SYSTEM                                                                744

 8/78  SYSTEM                                                                744

 9/78  SYSTEM                                                                720

10/78  SYSTEM                                                                744

11/78  SYSTEM                                                                720

12/78  SYSTEM                                                                744

 1/79  SYSTEM                                                                744

 2/79  SYSTEM                                                                672

 3/79  SYSTEM                                                                744
```

ELECTRIC POWER DEVELOPMENT CO.: ISOGO 2 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL | | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |

** PROBLEMS/SOLUTIONS/COMMENTS

100% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH MARCH 1979.

## SECTION 15
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | ELECTRIC POWER DEVELOPMENT CO. | |
| PLANT NAME | TAKASAGO | |
| UNIT NUMBER | 1 | |
| CITY | TAKASAGO | |
| STATE | JAPAN | |
| GROSS UNIT GENERATING CAPACITY - MW | 250.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 230.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 250.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | ****** | |
| AVERAGE HEAT CONTENT - J/G | 25958. | ( 11160 BTU/LB) |
| AVERAGE ASH CONTENT - % | 22.00 | |
| AVERAGE MOISTURE CONTENT - % | 7.00 | |
| AVERAGE SULFUR CONTENT - % | 1.80 | |
| AVERAGE CHLORIDE CONTENT - % | ******** | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | MITSUI - CHEMICO | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 3.2 | |
| INITIAL START-UP DATE | 2/75 | |
| COMMERCIAL START-UP DATE | **/** | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 93.00 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | ******** | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 13.1 | ( 208 GPM) |
| ** BYPRODUCT | | |
| BYPRODUCT NATURE | GYPSUM | |
| DISPOSITION | | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/78 | SYSTEM | | | | | | | 720 | | | |
| 5/78 | SYSTEM | | | | | | | 744 | | | |
| 6/78 | SYSTEM | | | | | | | 720 | | | |
| 7/78 | SYSTEM | | | | | | | 744 | | | |
| 8/78 | SYSTEM | | | | | | | 744 | | | |
| 9/78 | SYSTEM | | | | | | | 720 | | | |
| 10/78 | SYSTEM | | | | | | | 744 | | | |
| 11/78 | SYSTEM | | | | | | | 720 | | | |
| 12/78 | SYSTEM | | | | | | | 744 | | | |
| 1/79 | SYSTEM | | | | | | | 744 | | | |
| 2/79 | SYSTEM | | | | | | | 672 | | | |
| 3/79 | SYSTEM | | | | | | | 744 | | | |

ELECTRIC POWER DEVELOPMENT CO.: TAKASAGO 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL 1978 THROUGH MARCH 1979 NO FORCED OUTAGES OCCURRED. THE FGD SYSTEM AVAILABILITY WAS 99.9%.

## SECTION 15
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

| | |
|---|---|
| COMPANY NAME | ELECTRIC POWER DEVELOPMENT CO. |
| PLANT NAME | TAKASAGO |
| UNIT NUMBER | 2 |
| CITY | TAKASAGO |
| STATE | JAPAN |
| GROSS UNIT GENERATING CAPACITY - MW | 250.0 |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 230.0 |
| EQUIVALENT SCRUBBED CAPACITY - MW | 250.0 |
| ** FUEL DATA | |
| FUEL TYPE | COAL |
| FUEL GRADE | ****** |
| AVERAGE HEAT CONTENT - J/G | 25956. ( 11160 BTU/LB) |
| AVERAGE ASH CONTENT - % | 22.00 |
| AVERAGE MOISTURE CONTENT - % | 7.00 |
| AVERAGE SULFUR CONTENT - % | 1.80 |
| AVERAGE CHLORIDE CONTENT - % | ******** |
| ** FGD SYSTEM | |
| GENERAL PROCESS TYPE | WET SCRUBBING |
| PROCESS TYPE | LIMESTONE |
| SYSTEM SUPPLIER | MITSUI - CHEMICO |
| NEW/RETROFIT | RETROFIT |
| ENERGY CONSUMPTION - % | 3.2 |
| INITIAL START-UP DATE | 3/76 |
| COMMERCIAL START-UP DATE | **/** |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 93.00 |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | ******** |
| ABSORBER SPARE COMPONENTS INDEX | .0 |
| ** WATER LOOP | |
| TYPE | OPEN |
| FRESH MAKE-UP WATER - LITER/S | 13.1 ( 208 GPM) |
| ** BYPRODUCT | |
| BYPRODUCT NATURE | GYPSUM |
| DISPOSITION | |

### PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/78 | SYSTEM | | | | | | | 720 | | | |
| 5/78 | SYSTEM | | | | | | | 744 | | | |
| 6/78 | SYSTEM | | | | | | | 720 | | | |
| 7/78 | SYSTEM | | | | | | | 744 | | | |
| 8/78 | SYSTEM | | | | | | | 744 | | | |
| 9/78 | SYSTEM | | | | | | | 720 | | | |
| 10/78 | SYSTEM | | | | | | | 744 | | | |
| 11/78 | SYSTEM | | | | | | | 720 | | | |
| 12/78 | SYSTEM | | | | | | | 744 | | | |
| 1/79 | SYSTEM | | | | | | | 744 | | | |
| 2/79 | SYSTEM | | | | | | | 672 | | | |
| 3/79 | SYSTEM | | | | | | | 744 | | | |

ELECTRIC POWER DEVELOPMENT CO.: TAKASAGO 2 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL | | PER | BOILER | FGD | CAP. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SO2 | PART. | HOURS | HOURS | HOURS | FACTOR |

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD FROM APRIL 1978 THROUGH MARCH 1979 THE FGD SYSTEM OPERATED WITH 99.8% AVAILABILITY. THERE WERE NO FORCED OUTAGES DURING THIS TIME. A TOTAL OF 8147.4 HOURS WERE LOGGED WITH 19.5 HOURS OF SCHEDULED OUTAGE TIME.

## SECTION 15
## DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

| | | |
|---|---|---|
| COMPANY NAME | ELECTRIC POWER DEVELOPMENT CO. | |
| PLANT NAME | TAKEHARA | |
| UNIT NUMBER | 1 | |
| CITY | MIHARA | |
| STATE | JAPAN | |
| GROSS UNIT GENERATING CAPACITY - MW | 250.0 | |
| NET UNIT GENERATING CAPACITY W/FGD - MW | 231.0 | |
| EQUIVALENT SCRUBBED CAPACITY - MW | 250.0 | |
| ** FUEL DATA | | |
| FUEL TYPE | COAL | |
| FUEL GRADE | MITSUI MINING | |
| AVERAGE HEAT CONTENT - J/G | 25130. | ( 10804 BTU/LB) |
| AVERAGE ASH CONTENT - % | 23.00 | |
| AVERAGE MOISTURE CONTENT - % | 9.05 | |
| AVERAGE SULFUR CONTENT - % | 2.00 | |
| AVERAGE CHLORIDE CONTENT - % | .05 | |
| ** FGD SYSTEM | | |
| GENERAL PROCESS TYPE | WET SCRUBBING | |
| PROCESS TYPE | LIMESTONE | |
| SYSTEM SUPPLIER | BABCOCK - HITACHI | |
| NEW/RETROFIT | RETROFIT | |
| ENERGY CONSUMPTION - % | 3.2 | |
| INITIAL START-UP DATE | 2/77 | |
| COMMERCIAL START-UP DATE | 2/79 | |
| SO2 DESIGN REMOVAL EFFICIENCY - % | 94.20 | |
| PARTICULATE DESIGN REMOVAL EFFICIENCY - % | 91.70 | |
| ABSORBER SPARE COMPONENTS INDEX | .0 | |
| ** WATER LOOP | | |
| TYPE | OPEN | |
| FRESH MAKE-UP WATER - LITER/S | 14.1 | ( 224 GPM) |
| ** BYPRODUCT | | |
| BYPRODUCT NATURE | GYPSUM | |
| DISPOSITION | MARKETED | |

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/78 | SYSTEM | | | | | | | 720 | | | |
| 5/78 | SYSTEM | | | | | | | 744 | | | |
| 6/78 | SYSTEM | | | | | | | 720 | | | |
| 7/78 | SYSTEM | | | | | | | 744 | | | |
| 8/78 | SYSTEM | | | | | | | 744 | | | |
| 9/78 | SYSTEM | | | | | | | 720 | | | |
| 10/78 | SYSTEM | | | | | | | 744 | | | |
| 11/78 | SYSTEM | | | | | | | 720 | | | |
| 12/78 | SYSTEM | | | | | | | 744 | | | |
| 1/79 | SYSTEM | | | | | | | 744 | | | |
| 2/79 | SYSTEM | | | | | | | 672 | | | |
| 3/79 | SYSTEM | | | | | | | 744 | | | |

ELECTRIC POWER DEVELOPMENT CO.: TAKEHARA 1 (CONT.)

PERFORMANCE DATA

| PERIOD | MODULE | AVAILABILITY | OPERABILITY | RELIABILITY | UTILIZATION | % REMOVAL SO2 | % REMOVAL PART. | PER HOURS | BOILER HOURS | FGD HOURS | CAP. FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|

** PROBLEMS/SOLUTIONS/COMMENTS

99.95% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH MARCH 1979.

# APPENDIX A

# FGD SYSTEM COST DATA: OPERATIONAL AND NONOPERATIONAL SYSTEMS

## INTRODUCTION

The cost of flue gas desulfurization (FGD) systems for the control of sulfur dioxide emissions is an area of intense interest and substantial controversy. As a result, many computer models have recently been developed to estimate capital and annual costs. As part of an effort by the U.S. Environmental Protection Agency to provide meaningful economic data concerning FGD systems, reported economic data have been incorporated into the EPA Utility FGD Survey report. This information has appeared as a separate appendix of the report since October 1976. Until January 1978, this cost appendix consisted entirely of data reported by the utilities with little or no interpretation provided by PEDCo Environmental, Inc. Beginning with the May 1978 report, the format and content of the cost appendix were revised to include reported and adjusted costs for the operational FGD systems.

The rationale for including adjusted as well as reported costs stems primarily from the lack of comparability of the reported costs. Many of the reported cost figures, both capital and operating, are largely site-sensitive values that cannot be accurately compared because they refer to different FGD battery limits and different years in which the expenditures were made. As a result, an analysis of the cost data was made for the operational units since these systems offer the potential of having complete and accurate economic data. The adjustments were made to provide comparable, accurate cost data for the sulfur dioxide portion of the emission control system. This, in effect, will eliminate much of the confusion that exists concerning the reported data, and it will provide a common basis for the reported costs.

In an attempt to promote further comparability of the figures, the adjustment procedure was carried one step further and standardized adjusted figures were developed. This was done by modifying the fixed annual cost rates such that they would be identical for each unit (i.e. cost of depreciation, interim replacement, taxes, insurance and capital costs). The newly adjusted total fixed annual cost rate was applied to the total adjusted capital cost in each case and a standardized adjusted annual cost was obtained.

## APPROACH

In March 1978, each utility having at least one operational FGD system was given a cost form containing all available cost information then in the PEDCo files. The utility was asked to verify the data and fill in any missing information called for on the form. A follow-up visit by the PEDCo Environmental staff was arranged to assist in data acquisition and to insure completeness and reliability of information. Results of the cost analysis were forwarded to each participating utility for final review and comment.

The cost data were treated solely to establish the accurate costs for FGD systems, on a common basis, not to critique the design or reasonableness of the costs reported by any utility. Adjustments focused primarily on the following items:

- All capital costs were adjusted to July 1, 1977, dollars using the Chemical Engineering Index. All capital costs, represented in dollars/kilowatt ($/kW), were expressed in terms of gross megawatts (MW). Actual costs were reported by utilities in dollar values for years 1970 to 1980. These values are represented in terms of the year of greatest capital expenditures.

- Gross unit capacity was used to express all FGD capital expenditures because the capital requirement of an FGD system is dependent on actual boiler size before derating for auxiliary and air quality control power requirements.

- Particulate control costs were deducted. Since the purpose of the study was to estimate the incremental cost for sulfur dioxide control, particulate control costs were deducted using either data contained in the cost breakdowns or as a percentage of the total direct cost (capital and annual). The percentage reduction varied depending upon system design and operation.

- The capital costs associated with the modification or installation of equipment not part of the FGD system but needed for its proper functioning, were included (e.g. - stack lining, modification to existing ductwork or fans, etc.).

- Indirect charges were adjusted to provide adequate funds for engineering, field expenses, legal expenses, insurance, interest during construction, allowance for startup, taxes, and contingency.

- All annual costs, represented in mills/kilowatt-hour (mills/kWh), were expressed in terms of net megawatts (MW).

- Net unit capacity was used to express all FGD annual expenditures because the annual cost requirement of an FGD system is dependent on the actual amount of kilowatt-hours (kWh) produced by the unit after derating for auxiliary and air quality control power requirements.

- All annual costs were adjusted to a common capacity factor (65%).

- Replacement power costs were not included since only a few utilities reported such costs and these were presented using a variety of methods.

- Sludge disposal costs were adjusted to reflect the costs of sulfur dioxide waste disposal only (i.e., excluding fly ash disposal) and to provide for disposal over the anticipated lifetime of the FGD system. This latter correction was necessary since several utilities reported costs for sludge disposal capacity that would last only a fraction of the FGD system life. The adjustments were based on a land cost of $2000/acre with a sludge depth of 50 ft in a clay-lined pond (clay is assumed to be available at the site).

- A 30-year life was assumed for all process and economic considerations for all new systems that were installed for the life of the unit. A 20-year life was assumed for all process and economic considerations for retrofit systems that were installed for the remaining portion of the life of the unit.*

- Regeneration and by-product recovery facility costs were added for those regenerable systems not reporting such costs.

To the extent possible, all cost adjustments were made using the previous assumptions developed by PEDCo Environmental. When cost data were inadequate, adjustments were made using process design data in conjunction with the previous cost assumptions. In some cases, no adjustments were possible because of insufficient data.

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* The use of a 30-year service life for new units coincides with the conclusion of the National Power Survey of the Federal Power Commission which recognized this value as reasonable for steam-electric plants. A 20-year service life was assumed for all retrofit units even if the remaining life of the units is less than this value. Thus, two different rates are used and should be noted when making comparisons between new and retrofit systems.

## DESCRIPTION OF COST ELEMENTS

Capital costs consist of direct costs, indirect costs, contingency costs, and other capital costs. Direct costs include the "bought-out" cost of the equipment, the cost of installation, and site development. Indirect costs include interest during construction, contractor's fees and expenses, engineering, legal expenses, taxes, insurance, allowance for start-up and shakedown, and spares. Contingency costs include those costs resulting from malfunctions, equipment alterations, and similar unforeseen sources. Other capital costs include the nondepreciable items of land and working capital.

Annual costs consist of direct costs, fixed costs, and overhead costs. Direct costs include the cost of raw materials, utilities, operating labor and supervision, and maintenance and repairs. Fixed costs include those of depreciation, interim replacement, insurance, taxes, and interest on borrowed capital. Overhead costs include those of plant and payroll expenses. The various capital and annual cost components are discussed and defined in greater detail in the following paragraphs.

The direct capital costs include the following elements:

- Equipment required for the FGD system. Table A-1 provides a summary of the major process equipment used in regenerable and nonregenerable systems.

- Installation of equipment, including foundations; steel work for support, buildings, piping and ducting for effluents, slurries, sludge, and make-up water, control panels, instrumentation, insulation of ducting, buildings, piping, and other equipment, painting and piling.

- Site development may include clearing and grading, construction of access roads and walkways, establishment of rail, barge, and/or truck facilities, and parking facilities.

TABLE A-1. MAJOR FGD SYSTEM EQUIPMENT SUMMARY

| Category | Description |
|---|---|
| Material handling-raw materials | Equipment for the handling and transfer of raw materials includes unloading facilities, conveyors, storage areas and silos, vibrators, atmospheric emission control associated with these facilities, and related accessories. |
| Feed preparation-raw materials | Equipment for the preparation of raw material to produce a feed slurry consists of feed weighers, crushers, grinders, classifiers, ball mills, mixing tanks, pumps, agitators, and related accessories. |
| Sulfur dioxide absorption | Equipment for treating the flue gas includes absorbers, mist eliminators, hold tanks, agitators, circulating pumps, pond water return pumps, and related accessories. |
| Flue gas reheat | Equipment required includes air, steam, or hot water heaters, condensate tanks, pumps, soot blowers, fans, fuel storage facilities, gas bypass equipment, and related accessories. |
| Gas handling | Equipment to handle the boiler flue gas includes booster fans, ductwork, flue gas bypass system, turning vanes, supports, platforms, and related accessories. |
| Sludge disposal | Nonregenerable FGD systems require solids/water separation equipment such as clarifiers, vacuum filters, centrifuges, sludge fixation equipment, and related accessories. |
| Utilities | Equipment to supply power and water to the FGD equipment consists of switch-gear, breakers, transformers, piping, and related accessories. |
| By-product handling | Equipment for processing the by-product of regenerable FGD systems may include a rotary kiln, fluid bed dryer, conveyor, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boilers, hammer mills, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc. |

(continued)

TABLE A-1. (continued)

| Category | Description |
|---|---|
| Regeneration | Equipment for regeneration of the absorbing medium of an FGD system may consist of reactor vessels, material handling system, storage, weigh feeder, conveyor, rotary kiln, fluid bed calciner, dust collector, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boiler, hammer mill, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc. |
| Purge treatment | Equipment for the removal of purge material (e.g. sodium sulfate) includes refrigeration, pumps, tanks, crystallizer, centrifuge, dryer, dust collector, conveyors, storage, and related equipment. |
| Auxiliary | Equipment not directly related to the FGD system, but which may require design or modification to accommodate an FGD system may include such items as existing fans, ducts, or stack. If new fans, ducts, or stacks are added to improve boiler performance and accommodate the FGD system, the costs are prorated to the boiler and FGD system. |

Indirect capital costs include the following elements:

- Interest accrued on borrowed capital during construction.
- Contractor's fee and expenses, including costs for field labor payroll; field office supervision; personnel; construction offices; temporary roadways; railroad trackage; maintenance and welding shops; parking lot; communications; temporary piping and electrical and sanitary facilities; safety security (fire, material, medical, etc.); construction tools and rental equipment; unloading and storage of materials; travel expenses; permits; licenses; taxes; insurance; overhead; legal liabilities; field testing of equipment; start-up; and labor relations.
- Engineering costs, including administrative, process, project, and general; design and related functions for specifications; bid analysis; special studies; cost analysis; accounting; reports; consultant fees; purchasing; procurement; travel expenses; living expenses; expediting; inspection; safety; communications; modeling; pilot plant studies (if required because of process design or application novelty); royalty payments during construction; training of plant personnel; field engineering; safety engineering; and consultant services.
- Legal expenses, including those for securing permits, rights-of-way, etc.
- Taxes, including sales, and excise taxes.
- Insurance covering liability for equipment in transit and at site; fire, casualty, injury, and death; damage to property; delay; and noncompliance.
- Allowance for start-up and shakedown includes the cost associated with system start-up.
- Spare parts including pumps, valves, controls, special piping and fittings, instruments, spray nozzles, and similar items.

Other capital costs include the following elements:

- Land required for the FGD process, waste disposal, regeneration facility, and storage.
- Working capital, including the total amount of money invested in raw materials and supplies in stock, finished products in stock, and unfinished products

in the process of being manufactured; accounts receivable; cash kept on hand for payment of operating expenses such as salaries, wages, and raw materials purchases; accounts payable; and taxes payable.

Annual cost of an FGD system includes the following direct, fixed and overhead charges:

- Direct Charges
  - Raw materials, including those required by the FGD process for sulfur dioxide control, absorbent regeneration, sludge treatment, sludge fixation, flocculants, etc.
  - Utilities, including water for slurries, cooling and cleaning; electricity for pumps, fans, valves, lighting controls, conveyors, and mixers; fuel for reheating of flue gases; and stream for processing.
  - Operating labor, including supervisory, skilled, and unskilled labor required to operate, monitor, and control the FGD process.
  - Maintenance and repairs, consisting of both manpower and materials to keep the unit operating efficiently. The function of maintenance is both preventive and corrective to keep outages to a minimum.
  - Byproduct Sales: credit from the sale of byproducts regenerable FGD processes (e.g. sulfur, sulfuric acid) is a negative charge deducted from the annual direct cost to obtain the net annual direct cost of the FGD system.
- Fixed Charges
  - Depreciation - the annual charge to recover direct and indirect costs of physical assets over the life of the asset.
  - Interim, replacement - costs expended for temporary or provisional replacement of equipment that has failed or malfunctioned prematurely.
  - Insurance, including the costs of protection from loss by a specified contingency, peril, or unforeseen event. Required coverage could include losses due to fire, personal injury or death, property damage, explosion, lightning, or other natural phenomena.

- Taxes, including franchise, excise, and property taxes levied by a city, county, state, or Federal government.
- Interest on borrowed funds.

° Overhead

Plant and administrative overhead is a business expense that is not charged directly to a particular part of a project, but is allocated to it. Overhead costs include administrative, safety, engineering, legal and medical services; payroll; employee benefits; recreation; and public relations.

Table A-2 provides a summary of the means used to determine the missing cost elements if the costs were not reported or insufficient information prevented their actual determination. The assumptions and cost bases for determining the capital and annual costs of FGD systems were developed by the PEDCo staff based upon previous economic studies conducted for the U.S. EPA (Flue Gas Desulfurization Process Cost Assessment, May 1975; Simplified Procedures for Estimating Flue Gas Desulfurization System Costs, June 1976, EPA-600/2-76-150; Particulate and Sulfur Dioxide Emission Control Costs for Large Coal-Fired Boilers, March 1978, EPA-600/7-78-032).

## TABLE A-2. COST ELEMENT FACTORS

| Category | Value |
|---|---|
| Indirect capital costs: | |
| Interest during construction | 10% of total direct capital costs |
| Field overhead | 10% of total direct capital costs |
| Contractor's fee and expenses | 5% of total direct capital costs |
| Engineering | 10% of total direct capital costs |
| Taxes | 2% of total direct capital costs |
| Spares | 1% of total direct capital costs |
| Shakedown allowance | 5% of total direct capital costs |
| Other capital costs: | |
| Contingency[a] | 20% of total direct and indirect capital costs |
| Direct annual costs: | |
| Raw materials: | |
| Fixation chemicals | $2/ton |
| Lime | $40/ton |
| Limestone | $10/ton |
| Magnesium oxide | $150/ton |
| Sodium carbonate | $80/ton |
| Salt cake (credit) | $50/ton |
| Sulfur (credit) | $65/ton |
| Sulfuric acid (credit) | $25/ton |
| Utilities: | |
| Electricity | 25 mills/kWh |
| Water | \$0.20/10$^3$ gal |
| Steam | \$0.80/10$^6$ Btu |
| Operating labor: | |
| Direct labor | $8.50/man-hour |
| Supervision | 15% of direct labor costs |

[a] Contingency costs are used only when the cost data supplied are incomplete (such as equipment costs or direct costs only) and a contingency cost must be factored in to give an accurate estimate of the total capital cost.

(continued)

TABLE A-2. (continued)

| Category | Value |
|---|---|
| Maintenance: | |
| Labor and materials | 4% of total direct capital costs |
| Supplies | 15% of labor and materials costs |
| Overhead: | |
| Plant | 50% of operation and maintenance costs |
| Payroll | 20% of operating labor costs |
| Fixed annual costs: | |
| Depreciation | 3.33% or 5% (new or retrofit) |
| Interim replacement[b] | 0.7% or 0.35% |
| Taxes | 4% |
| Insurance | 0.3% |
| Capital costs | 9% |

[b] Some system components have life spans less than the expected service life of the system. Interim replacement is an allowance factor used in estimating annual revenue requirements to provide for the replacement of these short-lived items. An average allowance of 0.35% of the total investment is normally provided and used for systems with an expected service life of 20 years or less. A higher allowance of 0.70% of the total investment is provided and used for systems with an expected service life of 30 years or more.

## DEFINITION OF COST ELEMENTS

The costs displayed in Appendix A are accompanied by a series of alphabetic characters summarizing data presented for each FGD system. These relate to the cost elements described earlier in this section and identify what has been included and excluded for reported and adjusted capital and annual costs. The alphabetic characters, along with their titles, are briefly described in Table A-3.

## TABLE A-3. DESCRIPTION OF COST

| Code | Title | Description |
|---|---|---|
| A | Particulate control (required for FGD process) included in capital cost. | Particulate precollection device (ESP, fabric filter, venturi) prior to FGD system required for proper operation of $SO_2$ control system. |
| B | Particulate control (included in FGD process) included in capital cost. | Particulate collection equipment (venturi scrubber) is included in the FGD system. |
| C | Total direct capital costs included. | Complete cost of all FGD equipment, the labor and materials required for equipment installation, and interconnecting the system is included in the total capital cost. |
| D | Partial direct capital costs included. | One or a number of direct cost items, or the cost associated with one or a number of direct cost items, are excluded from the total capital cost. |
| E | Total indirect capital costs included. | Complete cost of all the indirect cost elements, including interest during construction, contractor's fees, engineering, legal expenses, taxes, insurance, allowance for start-up, and spares, is included in total capital cost. |
| F | Partial indirect costs included. | One or a number of indirect cost items, or the cost associated with one or a number of indirect cost items, are excluded from the total capital cost. |
| G | Chemical fixation of sludge included in capital cost. | The cost of a chemical fixation process which stabilizes the flue gas cleaning wastes prior to disposal is included in the total capital cost. |
| H | Dry sludge disposal included in capital cost. | The cost of a secondary dewatering or treatment method, such as filtration, centrifugation, or forced oxidation, which ultimately produces a dry sludge cake for final disposal, is included in the total capital cost. |
| I | Off-site landfill area included in capital cost. | The cost of an off-site area used as a landfill for flue gas cleaning wastes is included in the total capital cost. |
| J | Sludge pond included in capital cost. | The cost of an on-site disposal area for ponding of treated or untreated flue gas cleaning wastes is included in the total capital cost. |
| K | Additional sludge disposal capacity added for life of system. | The cost of additional $SO_2$ waste disposal capacity required for FGD system operation over the anticipated service life of the unit is included in the total capital cost. |
| L | Stack included in capital cost. | The cost of the stack is included in the total capital cost. |
| M | Modifications to stack, ducts, and/or fans included in capital cost. | Modifications to existing equipment (stack, fans, ducts, etc.) which are required because of inclusion of an FGD system. |
| N | Total regeneration facility cost included in capital cost. | Complete cost of entire regeneration facility included in total capital cost. |
| O | Partial regeneration facility cost included in capital cost. | Part of the cost associated with the regeneration facility included in the total capital cost. |
| P | R & D costs included in capital cost. | Bench scale or pilot plant studies to determine process and design characteristics. |

(continued)

TABLE A-3. (continued)

| Code | Title | Description |
|---|---|---|
| Q | Costs underwritten by system supplier included in capital cost. | Capital expenditures underwritten by the system supplier for system repairs or modifications for optimization of performance or R & D programs. |
| R | Excess reagent supply costs included in capital cost. | Capital expenditures for reagent supply exceeds the amount required for the period of initial operation. |
| S | Total direct annual costs included. | Complete cost of all raw materials, utilities, operating labor and maintenance and repairs is included in the total annual cost. |
| T | Partial direct annual costs included. | One or a number of direct annual cost items, or the cost associated with one or a number of direct annual cost items, are excluded from the total annual cost. |
| U | Total fixed annual costs included. | Complete cost of all fixed cost elements, including depreciation, interim replacement, insurance, taxes, and interest, is included in the total annual cost. |
| V | Partial fixed annual costs included. | One or a number of fixed annual cost items, or the cost associated with one or a number of fixed annual cost items, are excluded from the total annual cost. |
| W | Overhead cost included in total annual cost. | Plant and payroll overhead costs are included in the total annual cost. |
| X | Particulate control costs included in direct annual cost. | The cost of operating particulate collection equipment included in the FGD system is included in the total annual cost. |
| Y | Sludge disposal service costs (contract) included in direct annual cost. | The treatment and disposal of flue gas cleaning wastes that are handled by an outside firm. |
| Z | Replacement energy costs included in total annual costs. | The cost of additional power-generating capacity required to compensate for power used by the FGD system. |

# RESULTS OF COST ANALYSIS

The results of the operational FGD system survey are summarized in Table A-4 and Section A-1. Table A-4 produces a summary of a categorical analysis of the reported and adjusted capital and annual costs for the operational FGD systems addressed in the survey. Included in this categorical analysis are the ranges, means, and standard deviation for all the various types and categories of FGD systems examined. Section A-1 summarizes the reported and adjusted capital and annual costs for all the operational FGD systems that were addressed in the cost study (Section A-2 summarizes available cost data for nonoperational FGD systems).

## TABLE A-4. CATEGORICAL RESULTS OF THE REPORTED AND ADJUSTED CAPITAL AND ANNUAL COSTS FOR OPERATIONAL FGD SYSTEMS

| CATEGORY | REPORTED | | | | | | ADJUSTED | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CAPITAL, $/KW | | | ANNUAL, MILLS/KWH | | | CAPITAL, $/KW | | | ANNUAL, MILLS/KWH | | |
| | RANGE | AVG | DEV | RANGE | AVG | DEV | RANGE | AVG | DEV | RANGE | AVG | DEV |
| ALL | 29.2-189.0 | 80.9 | 40.2 | .1- 14.9 | 4.4 | 4.4 | 56.0-233.2 | 93.2 | 35.4 | 2.6- 13.0 | 5.7 | 2.7 |
| NEW | 31.8-189.0 | 80.4 | 39.6 | .1- 14.3 | 3.3 | 3.9 | 66.4-117.6 | 86.1 | 17.8 | 2.8- 8.7 | 5.2 | 2.0 |
| RETROFIT | 29.2-156.9 | 82.0 | 41.3 | 2.0- 14.9 | 6.1 | 4.5 | 56.0-233.2 | 100.2 | 45.8 | 2.6- 13.0 | 6.1 | 3.2 |
| THROWAWAY PRODUCT | 29.2-189.0 | 75.6 | 37.2 | .1- 14.3 | 4.2 | 4.1 | 56.0-140.6 | 86.2 | 21.9 | 2.6- 8.7 | 5.1 | 2.0 |
| SALEABLE PRODUCT | 127.9-156.9 | 142.3 | 14.5 | 2.0- 14.9 | 8.4 | 6.5 | 134.8-233.2 | 184.0 | 49.2 | 12.4- 13.0 | 12.7 | .3 |
| LIMESTONE | 31.8-168.0 | 74.0 | 37.9 | 1.3- 3.3 | 2.1 | .6 | 56.0-117.6 | 88.6 | 25.5 | 2.6- 6.6 | 4.6 | 1.6 |
| LIME | 29.2-128.3 | 74.9 | 32.2 | .1- 14.3 | 6.9 | 4.8 | 67.5-140.6 | 90.8 | 22.2 | 2.7- 8.7 | 6.4 | 2.0 |
| DUAL ALKALI | 43.2-189.0 | 96.7 | 65.5 | 3.2- 3.2 | 3.2 | .0 | *****- .0 | .0 | .0 | *****- .0 | .0 | .0 |
| LIME/ALKALINE FLYASH | 77.1- 85.9 | 80.0 | 4.1 | .3- .3 | .3 | .0 | 77.2- 93.0 | 82.5 | 7.4 | 4.1- 5.2 | 4.5 | .5 |
| SODIUM CARBONATE | 42.9-120.0 | 79.8 | 37.0 | 2.1- 2.1 | 2.1 | .0 | 60.9-107.9 | 76.6 | 22.2 | 3.2- 4.4 | 3.6 | .6 |
| WELLMAN LORD | 127.9-156.9 | 137.6 | 13.7 | 14.9- 14.9 | 14.9 | .0 | 134.8-134.8 | 134.8 | .0 | 12.4- 12.4 | 12.4 | .0 |
| LIMESTONE/ALKALINE FLYASH | 47.9- 47.9 | 47.9 | .0 | 2.0- 2.0 | 2.0 | .0 | 71.2- 71.2 | 71.2 | .0 | 2.8- 2.8 | 2.8 | .0 |
| MAGNESIUM OXIDE | 156.7-156.7 | 156.7 | .0 | 2.0- 2.0 | 2.0 | .0 | 233.2-233.2 | 233.2 | .0 | 13.0- 13.0 | 13.0 | .0 |

## SECTION A-1
## COSTS FOR OPERATIONAL FGD SYSTEMS

| UNIT DESCRIPTION | COST DESCRIPTION | COST<br>REPORTED | <br>ADJUSTED | <br>STANDARDIZED ADJUSTED |
|---|---|---|---|---|
| ALABAMA ELECTRIC COOP | CAPACITY FACTOR, % | *** | 65 | 65 |
| TOMBIGBEE | TOTAL CAPITAL, $/KW(YEAR) | 69.5(1978) | ******( 0) | ******( 0) |
| 3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 179.0 MW (NET) | COST ELEMENTS | C,E,J | | |
| ALLEGHENY POWER SYSTEM | CAPACITY FACTOR, % | 65 | 65 | 65 |
| PLEASANTS | TOTAL CAPITAL, $/KW(YEAR) | 128.3(1978) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.8(1978) | ******( 0) | ******( 0) |
| 519.0 MW (NET) | COST ELEMENTS | B,C,J,S | | |
| ARIZONA ELECTRIC POWER COOP | CAPACITY FACTOR, % | 44 | 65 | 65 |
| APACHE | TOTAL CAPITAL, $/KW(YEAR) | 35.9(1977) | ******( 0) | ******( 0) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.1(1978) | ******( 0) | ******( 0) |
| 195.0 MW (NET) | COST ELEMENTS | C,E,H,J,L,S,<br>U,W,Y,Z | | |
| ARIZONA ELECTRIC POWER COOP | CAPACITY FACTOR, % | 44 | 65 | 65 |
| APACHE | TOTAL CAPITAL, $/KW(YEAR) | 31.8(1977) | ******( 0) | ******( 0) |
| 3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.1(1978) | ******( 0) | ******( 0) |
| 195.0 MW (NET) | COST ELEMENTS | C,E,H,J,L,S,<br>U,W,Y,Z | | |
| ARIZONA PUBLIC SERVICE | CAPACITY FACTOR, % | 85 | 65 | 65 |
| CHOLLA | TOTAL CAPITAL, $/KW(YEAR) | 52.0(1973) | 56.0(1977) | 56.0(1977) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.2(1976) | 2.6(1977) | 2.3(1977) |
| 119.0 MW (NET) | COST ELEMENTS | B,C,E,S,U,X | C,E,K,S,U,W | C,E,K,S,U,W |
| ARIZONA PUBLIC SERVICE | CAPACITY FACTOR, % | 65 | 65 | 65 |
| CHOLLA | TOTAL CAPITAL, $/KW(YEAR) | 168.0(1978) | ******( 0) | ******( 0) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 1.5(1978) | ******( 0) | ******( 0) |
| 350.0 MW (NET) | COST ELEMENTS | B,D,T,X | | |
| BIG RIVERS ELECTRIC | CAPACITY FACTOR, % | *** | 65 | 65 |
| GREEN | TOTAL CAPITAL, $/KW(YEAR) | 43.2(1976) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 242.0 MW (NET) | COST ELEMENTS | B,C | | |
| CENTRAL ILLINOIS LIGHT | CAPACITY FACTOR, % | *** | 65 | 65 |
| DUCK CREEK | TOTAL CAPITAL, $/KW(YEAR) | 93.3(1978) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 3.3(1976) | ******( 0) | ******( 0) |
| 378.0 MW (NET) | COST ELEMENTS | C,E,J,M | | |
| CENTRAL ILLINOIS PUBLIC SERV | CAPACITY FACTOR, % | *** | 65 | 65 |
| NEWTON | TOTAL CAPITAL, $/KW(YEAR) | 189.0(1979) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 617.0 MW (NET) | COST ELEMENTS | C,E,G | | |
| COLORADO UTE ELECTRIC ASSN. | CAPACITY FACTOR, % | *** | 65 | 65 |
| CRAIG | TOTAL CAPITAL, $/KW(YEAR) | 73.7(1979) | ******( 0) | ******( 0) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 447.0 MW (NET) | COST ELEMENTS | A,C | | |

****** INDICATES COST FIGURES NOT YET AVAILABLE

## SECTION A-1
## COSTS FOR OPERATIONAL FGD SYSTEMS

| UNIT DESCRIPTION | COST DESCRIPTION | COST | | |
|---|---|---|---|---|
| | | REPORTED | ADJUSTED | STANDARDIZED ADJUSTED |
| COLUMBUS & SOUTHERN OHIO ELEC. | CAPACITY FACTOR, % | 48 | 65 | 65 |
| CONESVILLE | TOTAL CAPITAL, $/KW(YEAR) | 55.5(1975) | 70.7(1977) | 70.7(1977) |
| 5 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 5.8(1978) | 7.4(1977) | 7.4(1977) |
| 411.0 MW (NET) | COST ELEMENTS | B,C,J,M,S,U,W,X,Y | C,E,J,M,S,U,W,Y | C,E,J,M,S,U,W,Y |
| COLUMBUS & SOUTHERN OHIO ELEC. | CAPACITY FACTOR, % | 48 | 65 | 65 |
| CONESVILLE | TOTAL CAPITAL, $/KW(YEAR) | 55.5(1978) | 70.7(1977) | ******( 0) |
| 6 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 5.8(1978) | ******( 0) | ******( 0) |
| 411.0 MW (NET) | COST ELEMENTS | B,C,J,M,S,U,W,X,Y | C,E,J,M,S,U,W,Y | |
| DUQUESNE LIGHT | CAPACITY FACTOR, % | 64 | 65 | 65 |
| ELRAMA | TOTAL CAPITAL, $/KW(YEAR) | 113.4(1976) | 127.1(1977) | 127.1(1977) |
| 1-4 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 8.6(1977) | 7.8(1977) | 7.5(1977) |
| 510.0 MW (NET) | COST ELEMENTS | B,D,F,I,J,M,T,V,X,Y | C,E,I,J,M,S,U,Y | C,E,I,J,M,S,U,Y |
| DUQUESNE LIGHT | CAPACITY FACTOR, % | 70 | 65 | 65 |
| PHILLIPS | TOTAL CAPITAL, $/KW(YEAR) | 106.9(1972) | 140.6(1977) | 140.6(1977) |
| 1-6 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 7.8(1977) | 8.6(1977) | 8.2(1977) |
| 410.0 MW (NET) | COST ELEMENTS | B,D,F,I,J,M,T,V,X,Y | C,E,I,J,M,S,U,Y | C,E,I,J,M,S,U,Y |
| INDIANAPOLIS POWER & LIGHT | CAPACITY FACTOR, % | *** | 65 | 65 |
| PETERSBURG | TOTAL CAPITAL, $/KW(YEAR) | 99.5(1976) | 110.6(1977) | 110.6(1977) |
| 3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | 6.6(1977) | 7.4(1977) |
| 532.0 MW (NET) | COST ELEMENTS | C,F,G,J,M | C,E,G,J,M,S,U,W,Y | C,E,G,J,M,S,U,W,Y |
| KANSAS CITY POWER & LIGHT | CAPACITY FACTOR, % | 14 | 65 | 65 |
| HAWTHORN | TOTAL CAPITAL, $/KW(YEAR) | 29.2(1972) | 87.2(1977) | 87.2(1977) |
| 3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 8.4(1977) | 4.3(1977) | 4.4(1977) |
| 90.0 MW (NET) | COST ELEMENTS | B,D,F,T,X | B,C,E,J,K,S,U,W,X | B,C,E,J,K,S,U,W,X |
| KANSAS CITY POWER & LIGHT | CAPACITY FACTOR, % | *** | 65 | 65 |
| HAWTHORN | TOTAL CAPITAL, $/KW(YEAR) | 29.2(1972) | 87.2(1977) | 87.2(1977) |
| 4 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 8.4(1977) | 4.3(1977) | 4.4(1977) |
| 90.0 MW (NET) | COST ELEMENTS | B,D,F,T,X | B,C,E,J,K,S,U,W,X | B,C,E,J,K,S,U,W,X |
| KANSAS CITY POWER & LIGHT | CAPACITY FACTOR, % | 42 | 65 | 65 |
| LA CYGNE | TOTAL CAPITAL, $/KW(YEAR) | 53.6(1972) | 68.0(1977) | 68.0(1977) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 1.3(1978) | 3.8(1977) | 3.9(1977) |
| 874.0 MW (NET) | COST ELEMENTS | T | C,E,J,K,S,U | C,E,J,K,S,U |
| KANSAS POWER & LIGHT | CAPACITY FACTOR, % | *** | 65 | 65 |
| JEFFREY | TOTAL CAPITAL, $/KW(YEAR) | 56.8(1978) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******(1978) | ******( 0) | ******( 0) |
| 540.0 MW (NET) | COST ELEMENTS | B,C | | |
| KENTUCKY UTILITIES | CAPACITY FACTOR, % | 16 | 65 | 65 |
| GREEN RIVER | TOTAL CAPITAL, $/KW(YEAR) | 70.3(1975) | 77.5(1977) | 77.5(1977) |
| 1-3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 14.3(1977) | 2.7(1977) | 5.2(1977) |
| 64.0 MW (NET) | COST ELEMENTS | B,C,E,J,S,U,W | C,E,J,S,U,W | C,E,J,S,U,W |

****** INDICATES COST FIGURES NOT YET AVAILABLE

## SECTION A-1
## COSTS FOR OPERATIONAL FGD SYSTEMS

| UNIT DESCRIPTION | COST DESCRIPTION | COST | | |
|---|---|---|---|---|
| | | REPORTED | ADJUSTED | STANDARDIZED ADJUSTED |
| LOUISVILLE GAS & ELECTRIC | CAPACITY FACTOR, % | 55 | 65 | 65 |
| CANE RUN | TOTAL CAPITAL, $/KW(YEAR) | 66.5(1975) | 80.6(1977) | 80.6(1977) |
| 4 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.7(1977) | 5.8(1977) | 6.2(1977) |
| 188.0 MW (NET) | COST ELEMENTS | C,F,H,J,O,T | C,E,H,J,K,O,<br>S,U,W | C,E,H,J,K,O,<br>S,U,W |
| LOUISVILLE GAS & ELECTRIC | CAPACITY FACTOR, % | *** | 65 | 65 |
| CANE RUN | TOTAL CAPITAL, $/KW(YEAR) | 62.4(1977) | 67.5(1977) | 67.5(1977) |
| 5 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | 5.6(1977) | 5.6(1977) |
| 200.0 MW (NET) | COST ELEMENTS | C,E,H,J | C,E,H,J,K,S,<br>U,W | C,E,H,J,K,S,<br>U,W |
| LOUISVILLE GAS & ELECTRIC | CAPACITY FACTOR, % | *** | 65 | 65 |
| CANE RUN | TOTAL CAPITAL, $/KW(YEAR) | 57.9(1977) | ******( 0) | ******( 0) |
| 6 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 3.2(1979) | ******( 0) | ******( 0) |
| 299.0 MW (NET) | COST ELEMENTS | C,E,H,M,S,V,<br>W | | |
| LOUISVILLE GAS & ELECTRIC | CAPACITY FACTOR, % | 10 | 65 | 65 |
| MILL CREEK | TOTAL CAPITAL, $/KW(YEAR) | 42.6(1978) | ******( 0) | ******( 0) |
| 3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 1.3(1978) | ******( 0) | ******( 0) |
| 442.0 MW (NET) | COST ELEMENTS | C,S | | |
| LOUISVILLE GAS & ELECTRIC | CAPACITY FACTOR, % | *** | 65 | 65 |
| PADDY'S RUN | TOTAL CAPITAL, $/KW(YEAR) | 52.8(1973) | 76.4(1977) | 76.4(1977) |
| 6 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | 6.5(1977) | 6.4(1977) |
| 72.0 MW (NET) | COST ELEMENTS | C,E | C,E,S,U,W | C.E.S.U.W |
| MINNKOTA POWER COOPERATIVE | CAPACITY FACTOR, % | *** | 65 | 65 |
| MILTON R. YOUNG | TOTAL CAPITAL, $/KW(YEAR) | 85.9(1976) | 93.0(1977) | 93.0(1977) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | 5.2(1977) | 5.2(1977) |
| 405.0 MW (NET) | COST ELEMENTS | C,F,H,P | C,E,H,M,P,S,<br>U,W | C.E.H.M.P.S.<br>U.W |
| MONTANA POWER | CAPACITY FACTOR, % | 76 | 65 | 65 |
| COLSTRIP | TOTAL CAPITAL, $/KW(YEAR) | 77.1(1975) | 77.2(1977) | 77.2(1977) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | .3(1977) | 4.1(1977) | 4.1(1977) |
| 360.0 MW (NET) | COST ELEMENTS | B,C,E,J,P,T | C,E,J,K,P,S,<br>U,W | C,E,J,K,P,S,<br>U,W |
| MONTANA POWER | CAPACITY FACTOR, % | 76 | 65 | 65 |
| COLSTRIP | TOTAL CAPITAL, $/KW(YEAR) | 77.1(1975) | 77.2(1977) | 77.2(1977) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | .3(1977) | 4.1(1977) | 4.1(1977) |
| 360.0 MW (NET) | COST ELEMENTS | B,C,E,J,P,T | C,E,J,K,P,S,<br>U,W | C,E,J,K,P,S,<br>U,W |
| NEVADA POWER | CAPACITY FACTOR, % | 67 | 65 | 65 |
| REID GARDNER | TOTAL CAPITAL, $/KW(YEAR) | 42.9(1973) | 60.9(1977) | 60.9(1977) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.1(1977) | 3.2(1977) | 3.4(1977) |
| 125.0 MW (NET) | COST ELEMENTS | B,D,E,P,S,U,<br>W,X | B,D,E,P,S,U,<br>W,X | B,D,E,P,S,U,<br>W,X |
| NEVADA POWER | CAPACITY FACTOR, % | 67 | 65 | 65 |
| REID GARDNER | TOTAL CAPITAL, $/KW(YEAR) | 42.9(1973) | 60.9(1977) | 60.9(1977) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.1(1977) | 3.2(1977) | 3.4(1977) |
| 125.0 MW (NET) | COST ELEMENTS | B,D,E,P,S,U,<br>W,X | B,D,E,P,S,U,<br>W,X | B,D,E,P,S,U,<br>W,X |

****** INDICATES COST FIGURES NOT YET AVAILABLE

## SECTION A-1
## COSTS FOR OPERATIONAL FGD SYSTEMS

| UNIT DESCRIPTION | COST DESCRIPTION | COST | | |
|---|---|---|---|---|
| | | REPORTED | ADJUSTED | STANDARDIZED ADJUSTED |
| NEVADA POWER | CAPACITY FACTOR, % | 67 | 65 | 65 |
| REID GARDNER | TOTAL CAPITAL, $/KW(YEAR) | 113.6(1975) | 107.9(1977) | 107.9(1977) |
| 3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.1(1977) | 4.4(1977) | 5.0(1977) |
| 125.0 MW (NET) | COST ELEMENTS | B,C,E,L,S,U,W,X | B,C,E,L,S,U,W,X | B,C,E,L,S,U,W,X |
| NORTHERN INDIANA PUB SERVICE | CAPACITY FACTOR, % | 77 | 65 | 65 |
| DEAN H. MITCHELL | TOTAL CAPITAL, $/KW(YEAR) | 156.9(1976) | 134.8(1977) | 134.8(1977) |
| 11 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 14.9(1976) | 12.4(1977) | 11.0(1977) |
| 115.0 MW (NET) | COST ELEMENTS | B,C,E,L,N,S,U,W,X,Z | C,E,L,N,S,U,W,Z | C,E,L,N,S,U,W,Z |
| NORTHERN STATES POWER | CAPACITY FACTOR, % | 73 | 65 | 65 |
| SHERBURNE | TOTAL CAPITAL, $/KW(YEAR) | 47.9(1972) | 71.2(1977) | 71.2(1977) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.0(1977) | 2.8(1977) | 3.3(1977) |
| 740.0 MW (NET) | COST ELEMENTS | B,C,J,S,U,X,Z | C,E,J,K,S,U,W | C,E,J,K,S,U,W |
| NORTHERN STATES POWER | CAPACITY FACTOR, % | 73 | 65 | 65 |
| SHERBURNE | TOTAL CAPITAL, $/KW(YEAR) | 47.9(1972) | 71.2(1977) | 71.2(1977) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.0(1977) | 2.8(1977) | 3.3(1977) |
| 740.0 MW (NET) | COST ELEMENTS | B,C,J,S,U,X,Z | C,E,J,K,S,U,W | C,E,J,K,S,U,W |
| PACIFIC POWER & LIGHT | CAPACITY FACTOR, % | *** | 65 | 65 |
| JIM BRIDGER | TOTAL CAPITAL, $/KW(YEAR) | 120.0(1979) | ******( 0) | ******( 0) |
| 4 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 550.0 MW (NET) | COST ELEMENTS | C,E,J | | |
| PENNSYLVANIA POWER | CAPACITY FACTOR, % | 40 | 65 | 65 |
| BRUCE MANSFIELD | TOTAL CAPITAL, $/KW(YEAR) | 120.6(1975) | 102.1(1977) | 102.1(1977) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 14.3(1977) | 8.7(1977) | 10.8(1977) |
| 917.0 MW (NET) | COST ELEMENTS | B,C,E,G,I,L,S,U,W,X | C,E,G,I,M,S,U,W | C,E,G,I,M,S,U,W |
| PENNSYLVANIA POWER | CAPACITY FACTOR, % | 40 | 65 | 65 |
| BRUCE MANSFIELD | TOTAL CAPITAL, $/KW(YEAR) | 120.6(1975) | 102.1(1977) | 102.1(1977) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 14.3(1977) | 8.7(1977) | 10.8(1977) |
| 917.0 MW (NET) | COST ELEMENTS | B,C,E,G,I,L,S,U,W,X | C,E,G,I,M,S,U,W | C,E,G,I,M,S,U,W |
| PHILADELPHIA ELECTRIC | CAPACITY FACTOR, % | *** | 65 | 65 |
| EDDYSTONE | TOTAL CAPITAL, $/KW(YEAR) | 156.7(1972) | 233.2(1977) | 233.2(1977) |
| 1A | TOTAL ANNUAL, MILLS/KWH(YEAR) | 2.0(1972) | 13.0(1977) | 12.4(1977) |
| 120.0 MW (NET) | COST ELEMENTS | D,F,N,P | C,E,N,P | C,E,N,P |
| PUBLIC SERVICE OF NEW MEXICO | CAPACITY FACTOR, % | *** | 65 | 65 |
| SAN JUAN | TOTAL CAPITAL, $/KW(YEAR) | 127.9(1977) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 361.0 MW (NET) | COST ELEMENTS | A,C,E,N | | |
| PUBLIC SERVICE OF NEW MEXICO | CAPACITY FACTOR, % | *** | 65 | 65 |
| SAN JUAN | TOTAL CAPITAL, $/KW(YEAR) | 127.9(1977) | ******( 0) | ******( 0) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 350.0 MW (NET) | COST ELEMENTS | A,C,E,N | | |

****** INDICATES COST FIGURES NOT YET AVAILABLE

## SECTION A-1
## COSTS FOR OPERATIONAL FGD SYSTEMS

| | | COST | | |
|---|---|---|---|---|
| UNIT DESCRIPTION | COST DESCRIPTION | REPORTED | ADJUSTED | STANDARDIZED ADJUSTED |
| SALT RIVER PROJECT | CAPACITY FACTOR, % | *** | 65 | 65 |
| CORONADO | TOTAL CAPITAL, $/KW(YEAR) | 74.0(1978) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 280.0 MW (NET) | COST ELEMENTS | C,E | | |
| SOUTH CAROLINA PUBLIC SERVICE | CAPACITY FACTOR, % | 80 | 65 | 65 |
| WINYAH | TOTAL CAPITAL, $/KW(YEAR) | 47.4(1976) | 66.4(1977) | 66.4(1977) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 1.6(1975) | 2.9(1977) | 3.2(1977) |
| 140.0 MW (NET) | COST ELEMENTS | C,F,J,M,S,V | C,E,J,K,M,S,U,W | C,E,J,K,M,S,U,W |
| SOUTH MISSISSIPPI ELEC PWR | CAPACITY FACTOR, % | *** | 65 | 65 |
| R.D. MORROW | TOTAL CAPITAL, $/KW(YEAR) | 37.4(1975) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 124.0 MW (NET) | COST ELEMENTS | C,E | | |
| SOUTH MISSISSIPPI ELEC PWR | CAPACITY FACTOR, % | *** | 65 | 65 |
| R.D. MORROW | TOTAL CAPITAL, $/KW(YEAR) | 37.4(1975) | ******( 0) | ******( 0) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 124.0 MW (NET) | COST ELEMENTS | C,E | | |
| SOUTHERN ILLINOIS POWER COOP | CAPACITY FACTOR, % | 65 | 65 | 65 |
| MARION | TOTAL CAPITAL, $/KW(YEAR) | 152.7(1978) | ******( 0) | ******( 0) |
| 4 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 1.8(1978) | ******( 0) | ******( 0) |
| 184.0 MW (NET) | COST ELEMENTS | B,C,T,X | | |
| SOUTHERN INDIANA GAS & ELEC | CAPACITY FACTOR, % | *** | 65 | 65 |
| A.B. BROWN | TOTAL CAPITAL, $/KW(YEAR) | 43.0(1979) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 265.0 MW (NET) | COST ELEMENTS | C,E,G | | |
| SPRINGFIELD CITY UTILITIES | CAPACITY FACTOR, % | *** | 65 | 65 |
| SOUTHWEST | TOTAL CAPITAL, $/KW(YEAR) | 77.3(1974) | 117.6(1977) | 117.6(1977) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | 6.2(1977) | 6.9(1977) |
| 194.0 MW (NET) | COST ELEMENTS | C,F,H,J,P | C,E,H,J,K,P,S,U,W | C,E,H,J,K,P,S,U,W |
| TENNESSEE VALLEY AUTHORITY | CAPACITY FACTOR, % | 60 | 65 | 65 |
| WIDOWS CREEK | TOTAL CAPITAL, $/KW(YEAR) | 98.1(1976) | 113.1(1977) | 113.1(1977) |
| 8 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 3.0(1977) | 5.3(1977) | 5.1(1977) |
| 550.0 MW (NET) | COST ELEMENTS | B,C,E,P,R,T,U | C,E,J,S,U,W | C,E,J,S,U,W |
| UTAH POWER & LIGHT | CAPACITY FACTOR, % | 65 | 65 | 65 |
| HUNTER | TOTAL CAPITAL, $/KW(YEAR) | 91.1(1978) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | .1(1978) | ******( 0) | ******( 0) |
| 360.0 MW (NET) | COST ELEMENTS | B,C,T,X | | |
| UTAH POWER & LIGHT | CAPACITY FACTOR, % | 80 | 65 | 65 |
| HUNTINGTON | TOTAL CAPITAL, $/KW(YEAR) | 85.9(1978) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 1.4(1978) | ******( 0) | ******( 0) |
| 366.0 MW (NET) | COST ELEMENTS | B,C,T,X | | |

****** INDICATES COST FIGURES NOT YET AVAILABLE

## SECTION A-2
## COSTS FOR NON-OPERATIONAL FGD SYSTEMS

| UNIT DESCRIPTION | COST DESCRIPTION | COST REPORTED | COST ADJUSTED | COST STANDARDIZED ADJUSTED |
|---|---|---|---|---|
| BASIN ELECTRIC POWER COOP | CAPACITY FACTOR, % | *** | 65 | 65 |
| LARAMIE RIVER | TOTAL CAPITAL, $/KW(YEAR) | 56.0(1980) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | .9(7800) | ******( 0) | ******( 0) |
| 600.0 MW (NET) | COST ELEMENTS | C,E | | |
| BASIN ELECTRIC POWER COOP | CAPACITY FACTOR, % | *** | 65 | 65 |
| LARAMIE RIVER | TOTAL CAPITAL, $/KW(YEAR) | 56.0(1980) | ******( 0) | ******( 0) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | .9(7800) | ******( 0) | ******( 0) |
| 600.0 MW (NET) | COST ELEMENTS | C,E | | |
| BOSTON EDISON | CAPACITY FACTOR, % | *** | 65 | 65 |
| MYSTIC | TOTAL CAPITAL, $/KW(YEAR) | 63.4(1972) | ******( 0) | ******( 0) |
| 6 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 3.0(1974) | ******( 0) | ******( 0) |
| 150.0 MW (NET) | COST ELEMENTS | B,C,E,N,Q | | |
| COLORADO UTE ELECTRIC ASSN. | CAPACITY FACTOR, % | *** | 65 | 65 |
| CRAIG | TOTAL CAPITAL, $/KW(YEAR) | 86.5(1979) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 447.0 MW (NET) | COST ELEMENTS | B,D,E | | |
| COMMONWEALTH EDISON | CAPACITY FACTOR, % | *** | 65 | 65 |
| POWERTON | TOTAL CAPITAL, $/KW(YEAR) | 125.0(1979) | ******( 0) | ******( 0) |
| 51 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 450.0 MW (NET) | COST ELEMENTS | C,E,H,J | | |
| COMMONWEALTH EDISON | CAPACITY FACTOR, % | 49 | 65 | 65 |
| WILL COUNTY | TOTAL CAPITAL, $/KW(YEAR) | 113.0(1972) | ******( 0) | ******( 0) |
| 1 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 13.1(1975) | ******( 0) | ******( 0) |
| .0 MW (NET) | COST ELEMENTS | B,C,E,G,J,X | | |
| DETROIT EDISON | CAPACITY FACTOR, % | *** | 65 | 65 |
| ST. CLAIR | TOTAL CAPITAL, $/KW(YEAR) | 80.3(1976) | ******( 0) | ******( 0) |
| 6 | TOTAL ANNUAL, MILLS/KWH(YEAR) | 9.6(1976) | ******( 0) | ******( 0) |
| .0 MW (NET) | COST ELEMENTS | B,C,E,J,M,X | | |
| ILLINOIS POWER COMPANY | CAPACITY FACTOR, % | *** | 65 | 65 |
| WOOD RIVER | TOTAL CAPITAL, $/KW(YEAR) | 82.5(1972) | ******( 0) | ******( 0) |
| 4 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 110.0 MW (NET) | COST ELEMENTS | A,C,E,M,N | | |
| POTOMAC ELECTRIC POWER | CAPACITY FACTOR, % | *** | 65 | 65 |
| DICKERSON | TOTAL CAPITAL, $/KW(YEAR) | 68.0(1978) | ******( 0) | ******( 0) |
| 3 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| .0 MW (NET) | COST ELEMENTS | A,C,E,M | | |
| PUBLIC SERVICE OF COLORADO | CAPACITY FACTOR, % | *** | 65 | 65 |
| VALMONT | TOTAL CAPITAL, $/KW(YEAR) | 87.0(1974) | ******( 0) | ******( 0) |
| 5 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 166.0 MW (NET) | COST ELEMENTS | B,C,E,J | | |

****** INDICATES COST FIGURES NOT YET AVAILABLE

## SECTION A-2
## COSTS FOR NON-OPERATIONAL FGD SYSTEMS

| UNIT DESCRIPTION | COST DESCRIPTION | COST<br>REPORTED | <br>ADJUSTED | <br>STANDARDIZED ADJUSTED |
|---|---|---|---|---|
| SALT RIVER PROJECT | CAPACITY FACTOR, % | *** | 65 | 65 |
| CORONADO | TOTAL CAPITAL, $/KW(YEAR) | 74.0(1978) | ******( 0) | ******( 0) |
| 2 | TOTAL ANNUAL, MILLS/KWH(YEAR) | ******( 0) | ******( 0) | ******( 0) |
| 280.0 MW (NET) | COST ELEMENTS | C,E | | |

****** INDICATES COST FIGURES NOT YET AVAILABLE

# APPENDIX B

# DEFINITIONS

# DEFINITIONS

| | |
|---|---|
| Boiler Commercial Service Date | Date when boiler and auxiliary equipment (including FGD system for new boilers) has met initial supplier guarantees and begins to contribute electrical power to the power grid. |
| Byproduct | The nature (e.g. elemental sulfur, sulfuric acid) and disposition (e.g. stockpile on site, marketed) of the end product by systems that generate a saleable product. |
| Commercial Service Date (FGD System) | Date when the FGD system successfully completes compliance testing and the utility is satisfied that the system meets supplier contractual guarantees. |
| Company Name | Name of corporation as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - as space permits. |
| Disposal | Disposal method for throwaway product systems producing sludge including: stabilized or unstabilized sludge, interim and final disposal sites and disposal type (minefill, landfill, etc.) as well as disposal location. |
| Efficiency: | |
| Particulate Matter | The actual percentage of particulate matter removed by the emission control system (mechanical collectors, ESP, or fabric filter and FGD) from the untreated flue gas. |
| $SO_2$ | The actual percentage of $SO_2$ removed from the flue gas by the FGD system. |

## FGD Viability Indexes

Several parameters have been developed to quantify the viability of FGD system technology. Various terms such as "availability," "reliability," "operability," and "utilization" are used to accurately represent the operation of any FGD system during a given period. The above-mentioned parameters are defined below and discussed briefly. The objectives of this discussion are to make the reader aware that several different definitions are being used and to select appropriate parameters that can be used for reporting purposes so that reasonably consistent comparisons can be made.

### Availability Index

Hours the FGD system is available for operation (whether operated or not) divided by hours in period, expressed as a percentage. This parameter tends to overestimate the viability of the FGD system because it does not penalize for election not to operate the system when it could have been operated. Boiler downtime may tend to increase the magnitude of the parameter because FGD failures generally cannot occur during such periods.

### Reliability Index

Hours the FGD system was operated divided by the hours the FGD system was called upon to operate, expressed as a percentage. This parameter has been developed in order not to penalize the FGD system for elected outages, e.g., periods when the FGD system could have been run but was not run because of chemical shortages, lack of manpower, short duration boiler operations, etc. The main problem in using this

| | |
|---|---|
| | formula is the concise determination whether or not the system was "called upon to operate" during a given time period. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available). |
| FGD Operability Index | Hours the FGD system was operated divided by boiler operating hours in period, expressed as a percentage. This parameter indicates the degree to which the FGD system is actually used, relative to boiler operating time. The parameter is penalized when options are exercised not to use the FGD system in periods when the system is operable. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available). |
| FGD Utilization Index | Hours that the FGD system operated divided by total hours in period. This parameter is a relative stress factor for the FGD system. It is not a complete measure of FGD system viability because the parameter can be strongly influenced by conditions that are external to the FGD system (e.g., infrequent boiler operation will lower the value of the parameter although the FGD system may be highly dependable in its particular application). |
| End Product | |
| Saleable | The $SO_2$ removed from the flue gas is recovered in a usable or marketable form (e.g., sulfur, sulfuric acid, gypsum, |

| | |
|---|---|
| | ammonium sulfate, sodium sulfate). |
| Throwaway | The $SO_2$ removed from the flue gas is not recovered in a usable or marketable form and resulting sulfur-bearing waste products must be disposed in an environmentally acceptable fashion. |
| Energy Consumption, % | The percentage of gross unit electrical generating capacity consumed by the FGD system, as defined by the following equation:<br>[Net MW w/o FGD - Net MW w/FGD]/ Gross unit rating] |
| Equivalent Scrubbed Capacity (ESC) | The effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system. |
| FGD Status: | |
| Category 1 | Operational - FGD system is in service removing $SO_2$. |
| Category 2 | Under construction - ground has been broken for installation of FGD system, but FGD system has not become operational. |
| Category 3 | Planned, Contract Awarded - contract has been signed for purchase of FGD system but ground has not been broken for installation. |
| Cateogry 4 | Planned, Letter of Intent Signed - letter of intent has been signed, but legal contract for purchase has not been awarded. |
| Category 5 | Planned, Requesting/Evaluating Bids - bid requests have been released but no letter of intent or contract has been issued. |

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| Category 6 | Considering only FGD Systems - an FGD system is proposed as a means to meet an $SO_2$ regulation. |
| Category 7 | Considering an FGD system as well as alternative methods. |
| Category 8 | Nonoperational - FGD system has been operated in the past but has been shut down permanently or for an extended indefinite period of time. |
| Fuel Firing Rate - TPH | Boiler fuel firing rate in terms of tons per hour at maximum continuous load. |
| General Process Type | The manner in which the $SO_2$ from the flue gas is collected, e.g., wet scrubbing, spray drying, dry adsorption. |
| Initial Start-Up (FGD System) | Date when flue gas first passes through any component of the FGD system (or is scheduled to do so). |
| New | FGD unit and boiler were designed at the same time or space for addition of an FGD unit was reserved when boiler was constructed. |
| Plant Name | Unit identification as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - or as indicated by utility representative for installations in planning stages. |
| Process Additives | A chemical compound or element which is added to the process or normally found with the main process reagent in small quantities (e.g., Mg, adipic acid) to promote improved process operation (e.g., scale reduction, increased $SO_2$ removal efficiency). |

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| Process Type | Company name if process is patented. Generic name if several companies have similar processes (e.g., Lime, Limestone, Wellman Lord, Thoroughbred 121). |
| Regulatory Class | A. New boiler constructed subject to Federal New Source Performance Standards (NSPS), 8/17/71.<br>B. Existing boiler subject to State Standard that is more stringent than the NSPS, 8/17/71.<br>C. Existing boiler subject to State Standard that is equal to or less stringent than NSPS, 8/17/71.<br>D. Other (unknown, undetermined). |
| Retrofit | FGD unit will be/was added to an existing boiler not specifically designed to accommodate FGD unit. |
| Spare Capacity Index - % | The summation of the individual component capacities (%) minus 100%. |
| Spare Component Index | The equipment spare capacity index (%) divided by the individual component capacity (%). |
| System Supplier | A firm that fabricates and supplies flue gas desulfurization systems. |
| Total Controlled Capacity (TCC) | The gross rating (MW) of a unit brought into compliance with FGD, regardless of the percent of flue gas treated at the facility. In the case of prototype and demonstration FGD systems, this figure will be identical to the Equivalent Scrubbed Capacity rather than |

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| | the gross unit rating if the system is not meant to bring the facility into compliance with $SO_2$ emission standards. |
| Unit Rating | |
| Gross | Operational - Maximum continuous gross generation capacity in MW; Preoperational - maximum continuous design generation capacity in MW. |
| New w/FGD | Gross unit rating less the energy required to operate ancillary station equipment, inclusive of emission control systems. |
| Net w/o FGD | Gross unit rating less the energy required to operate ancillary station equipment, exclusive of emission control systems. |

# APPENDIX C

# TABLE OF UNIT NOTATION

# TABLE OF UNIT NOTATION

| Classification | English Unit | Symbol | Survey Report Notation | ASTM/SI Unit | Symbol | Survey Report Notation |
|---|---|---|---|---|---|---|
| Area | Acre | acre | ACRE | Square meter | $M^2$ | SQ.M |
| | Square foot | $ft^2$ | SQ.FT | Square meter | $M^2$ | SQ.M |
| Concentration | Grains per standard cubic foot | gr/scf | GR/SCF | Grams per cubic meter | $g/m^3$ | G/CU.M |
| | Parts per million | ppm | PPM | Parts per million | ppm | PPM |
| | Pounds per million Btu | $lb/10^6$ Btu | LB/MMBTU | Nanograms per joule | ng/J | NG/J |
| Flow | Actual cubic feet per minute | $ft^3/min$ (actual) | ACFM | Cubic meters per second | $m^3/s$ | CU.M/S |
| | Gallons per minute | gal/min | GPM | Liters per second | liter/s | LITER/S |
| | Pounds per minute | lb/min | LB/MIN | Kilogram per second | kg/s | KG/S |
| | Ton per day | t/day | TPD | Metric ton per day | M t/d | M T/D |
| | Ton per hour | t/h | TPH | Metric ton per hour | M t/h | M T/H |
| Heat Content | Btu per pound | Btu/lb | BTU/LB | Joules per gram | J/g | J/G |
| Length | Foot | ft | FT | Meter | m | M |
| | Inch | in | IN | Centimeter | cm | CM |
| | Mile | mi | MI | Kilometer | km | KM |
| L/G Ratio | Gallons per thousand actual cubic feet | gal/1000 $ft^3$ (actual) | GAL/1000ACF | Liters per cubic meter | $liter/m^3$ | LITER/CU.M |
| Mass/Weight | Pound | lb | LB | Kilogram | kg | KG |
| | Ton | t | T | Megagram | Mg | MG |
| Pressure | Inches of water | in. $H_2O$ | IN. $H_2O$ | Kilopascal | kPa | KPA |
| Temperature | Degree Fahrenheit | °F | F | Degree Celsius | °C | C |
| Volume | Cubic feet | $ft^3$ | CU.F | Cubic meter | $m^3$ | CU.M |
| | Acre-feet | Acre-ft | ACRE-FT | Cubic meter | $m^3$ | CU.M |